ALLEN M. PERRY
Managing Editor
EARL WHITEHORNE
Contributing Editor
G. F. WITTIG
Statistical Editor
H. M. CAMERON
Associate Editor
A. E. KNOWLTON
Associate Editor
F. C. WELLS
News Editor
E. R. SEARLES
Assistant Editor

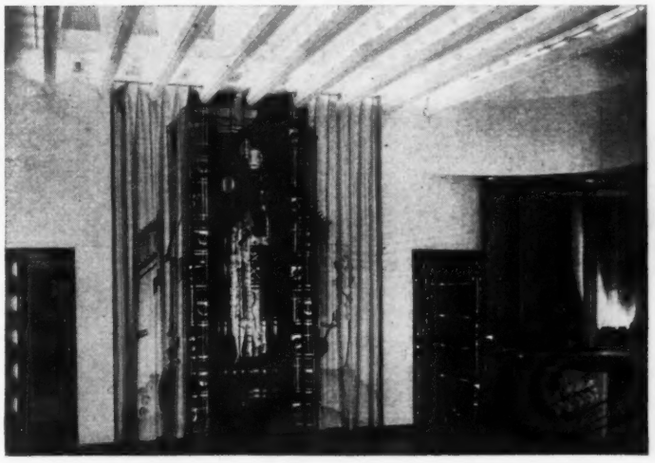
ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

L. W. W. MORROW, *Editor*

FRANK R. INNES
Western Editor
520 N. Michigan Ave.
Chicago
H. S. KNOWLTON
New England Editor
1427 Statler Bldg.
Boston
WALTER C. HESTON
Pacific Coast Editor
883 Mission St.
San Francisco
PAUL WOOTON
Washington
Correspondent
National Press Bldg.
Washington

JAMES H. RUDD
Publishing Director



Night Club Lighting, SS. Leviathan

OCTOBER 18, 1930

Contents Copyrighted, 1930, by McGraw-Hill Publishing Company, Inc.

VOLUME 96 . . . NUMBER 16

News of the Industry 715

Controlling the Deflection of Suspension Insulators 726
By C. A. BOOKER and A. E. HILL, *New England Power Association*

A National Viewpoint of Utility Problems 731
By W. A. JONES, *President National Electric Light Association*

Recent Developments in Steel Industry 734
By W. H. BURR, *Lukens Steel Company*

Insull Optimistic 737

A Departure in Substation Design 740
By W. B. MORTON *and* BASIL PAYNE, *Allied Engineers, Inc.*

Editorials 723
Power-Factor Correction for Neon Signs 728
Meters Stored and Transported on Unit Racks 729
Dynamite Sets Poles Efficiently in Soggy Soil 729
Oscillograph Technique in Lightning Studies 730
Power Plants Looked Big a Quarter Century Ago 732
Mercury-Arc Rectifiers Save Railroad Space and Energy .. 733
Free Wiring Stimulates Range Sales 736
Germany Moves Toward Higher Light Intensities 736
Profits in Merchandising Losses 738
Difficult Angle Turn Made with Braced Tower 739
What Customers Think of One Utility Company 746
Lighting Outdoor Substation. 746
Financial and Statistical 751

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

JAMES H. MCGRAW, Chairman of the Board
MALCOLM MUIR, President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
HAROLD W. MCGRAW, Vice-President
H. C. PARMELEE, Editorial Director
C. H. THOMPSON, Secretary

CABLE ADDRESS: "MACHINIST, N. Y."

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter, January 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 18,100

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Avenue
PHILADELPHIA, 1600 Arch Street
CLEVELAND, 501 Guardian Building
ST. LOUIS, 1556 Bell Telephone Building
SAN FRANCISCO, 883 Mission Street
BOSTON, 1427 Statler Building
GREENVILLE, S. C., 1301 Woodside Building
DETROIT, 2-257 General Motors Building
LOS ANGELES, 632 Chamber of Commerce Bldg.
LONDON, 6 Bouverie Street, London, E. C. 4

16 Million FEET OF OKONITE CALLENDER CABLES

are tangible evidence of customer satisfaction

IN five years the OKONITE-CALLENDER Co., Inc., has made and distributed this great quantity of impregnated paper insulated cables.

Installations of OKONITE-CALLENDER cables aggregating 16,000,000 feet, dot the populous parts of every state in the country. These cables are of all types, ranging from secondary voltages to 65 kv and 132 kv. They have made an excellent service record in underground, aerial, submarine, and station plant.

This background of demonstrated operating performance and customer satisfaction is convincing to those who want absolute assurance of long life and continuous service.

Airplane view of the OKONITE-CALLENDER Cable Co.'s plant at Paterson, New Jersey, where every modern facility is installed for the specialized manufacture of impregnated paper insulated cables of all types.

OKONITE PRODUCTS

Okonite Insulated Wires and Cables

•

Varnished Cambric Cables

•

Okonite Insulating Tape

•

Manson & Dundee Friction Tapes

•

Okocord

•

Okoloom

OKONITE-CALLENDER PRODUCTS

Impregnated Paper Cables

•

Super-tension Cables

•

Splicing Materials

THE OKONITE COMPANY

Founded 1878

THE OKONITE-CALLENDER CABLE COMPANY, INC.

Factories: Passaic, N. J. Paterson, N. J.

SALES OFFICES: NEW YORK CHICAGO PITTSBURGH ST. LOUIS BOSTON ATLANTA BIRMINGHAM SAN FRANCISCO LOS ANGELES SEATTLE DALLAS

Novelty Electric Co., Philadelphia, Pa. F. D. Lawrence Electric Co., Cincinnati, O.

Canadian Representatives: Engineering Materials, Limited, Montreal

Cuban Representatives: Victor G. Mendoza Co., Havana

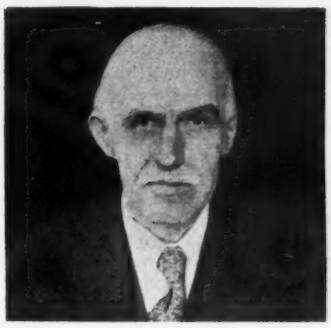
OKONITE

OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

ELECTRICAL WORLD

for the Week Ending

October 18, 1930



How can rates be reasonable that show such widely divergent results where the service is almost if not entirely identical?
MILO R. MALTBIE
Chairman New York
Public Service Commission.

Sloan defends New York rate cut as fair to all

England starts first 132-kv. line in central scheme

Connecticut commissioners' removal must be pressed

—CONNECTICUT Public Utilities Commission once more in technical jeopardy. Attorney-General of the state, again ordered to seek members' removal for failure to enforce grade-crossing law, appeals to court of final resort.

—STEEL INDUSTRY possesses 2,370,000 hp. in main-roll drives. Application of large reversing-mill motors continues as pronounced trend in this highly specialized field.

—W. A. JONES pleads for spread of industry facts. "I do feel that much more can be accomplished by cool reasoning with an intelligent public than by heated argument with an uninformed critic."

—SAMUEL INSULL optimistic over utility prospects in general business depression. Backs up his faith by planning $29,228,351 financing through issuance of rights to stockholders.

—ENGLAND now has its first 132-kv. line. As an essential part of the co-ordinated plan for electrical development in the British Isles, high-tension lines are being built; the first is now in operation.

—INDUSTRIAL ACTIVITY rose 5 per cent from August to September, gaged by energy use in individual industries; but level continues far below last year's.

—NEW YORK CITY'S $6,000,000 rate reduction still pending. M. S. Sloan, defending the companies' proposal, says that approval of board of directors for this reduction would now, as a new offer, be difficult, but that proposal stands.

NEWS OF THE WEEK

Mitchell's Ruling Meets Political Attack —Arizona's Fight—Riparian Rights

BACKED by Senator Brookhart of Iowa and other members of Congress, the National Popular Government League has begun a fight at Washington to prevent the Federal Power Commission from exchanging licenses held by large power companies for "minor-part" licenses, free of all regulation. The league sees in this possibility "the most far-reaching attack upon the federal water-power act ever attempted."

The agitation has arisen because of Attorney-General Mitchell's recent opinion advising the power commission that it may grant a "minor-part" license to the Appalachian Electric Power Company on the New River in West Virginia. The general purport of the Attorney-General's decision was given in the ELECTRICAL WORLD for October 4 (page 631).

"If this is done," says the league, "a precedent will be set which will destroy national control over more than 90 per cent of our power sites, including licenses now issued and those to come." The opinion, the league claims, "negates the purpose of the federal power act, flouts the plain intent of Congress and the people, and ditches 25 years of conservation effort."

Senator Brookhart's point of view is challenged by F. E. Bonner, executive secretary of the commission. In a memorandum to Acting Chairman Wilbur he declares that the states have ample power to protect all essential public interest on non-navigable portions of streams where the federal interest can be protected amply by a minor-part license.

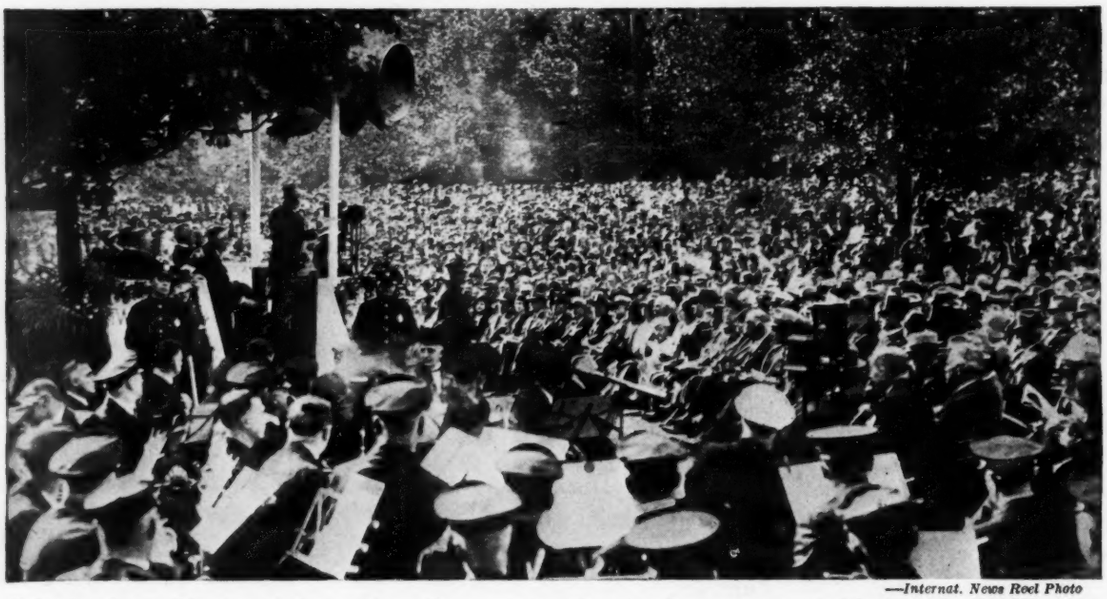
Arizona fights on

Announcement that the United States Supreme Court will consider Arizona's contention that the Boulder Dam act is unconstitutional is welcomed by Secretary Wilbur as a means of settling the last doubt of any lack of authority in the federal government to execute the project.

Comptroller-General McCarl has dismissed Arizona's contention that the initial appropriation of $10,660,000 for commencing construction should be held up because of the alleged inability of the city of Los Angeles and the Metropolitan Water District of Southern California to make the contracts for power and water. The validity of these contracts, held by Arizona to be illegal,

▼ ▼ ▼

MANY HUNDREDS SEE MEMORIAL TO WESTINGHOUSE DEDICATED



—*Internat. News Reel Photo*

Schenley Park, Pittsburgh, drew this audience on October 6, when, as recounted last week, the Westinghouse industries dedicated the handsome memorial they have erected in honor of their founder through the subscriptions of employees.

HERE CITIZENS BATHE IN LIGHT AS WELL AS IN WATER

Alluring night view of a recently opened municipal swimming pool at Clairton, Pa., near Pittsburgh. The pool, which measures 130 x 210 ft., is equipped with 80 250-watt Westinghouse "Aqualux" lighting units, each of which sends a beam approximately 50 ft. under water.

▼ ▼ ▼

had been upheld previously by Attorney-General Mitchell.

Arizona's determination to insist in all quarters upon the position that it has taken in regard to the utilization of the waters of the Colorado River is indicated by its protest against the canceling of its pending applications under the water-power act. The Federal Power Commission in June served notice on all applicants for Colorado River rights that ninety days would be allowed to show cause why these applications should not be rejected.

One of these applications covers the Parker Dam site desired by the Metropolitan Water District as the point of diversion for its proposed two-hundred-million-dollar aqueduct to provide water for southern California. Arizona takes the position that California has no right to flood lands in Arizona.

Riparian owners win point

No appeal apparently will be made by the government from the action of the federal court in California refusing to restrain owners of riparian lands along the San Joaquin River from prosecuting claims for damages against licensees of the Federal Power Commission. The decision is the second victory for the owners of grass lands who allege that they are damaged when storage of water above prevents overflow of their lands.

▼

Southern Sierras Power Gets Hoover Dam Work

SECRETARY WILBUR announced on Wednesday that the contract for all the electrical power the government will use in constructing Hoover Dam, on the Colorado River, has been let to the Southern Sierras Power Company of Riverside, Calif., one of the three bidders.

Based on estimated power requirements for construction work, lighting the city to be built for the working forces, pumping water and all other needs, the total cost to the government will be about $1,730,000.

A transmission line to carry the power to the dam site from the company's lines at San Bernardino or Victorville, Calif., will be utilized after the project is completed to carry energy generated at the dam to California.

▼

Investment Bankers Deprecate "Power Issue"

MEETING IN CONVENTION at New Orleans this week, the Investment Bankers' Association opposed the extension of the Federal Power Commission's authority beyond its original limitations and condemned the injection of a "power issue" into national politics.

The committee on public service securities, in a report which was unanimously adopted by the convention, urged the leasing of Muscle Shoals by the government to the highest bidder. "Let the government keep out of business," the report said, "but let it always regulate adequately, through the states if possible, otherwise fearlessly through federal authority. The need of federal regulation in this industry, we believe, does not now exist."

The committee recommended the simplification of the capital structure of public utility groups. It pointed out that while there is a definite tendency toward that simplification, many of the groupings are still complicated and involved "beyond any apparent reason or need."

Francis E. Frothingham of Coffin & Burr, Inc., of Boston, chairman of the committee, referred to the dangers that lurk in the concealment of intercompany transactions and criticised pyramiding.

Electrification Interests A. I. E. E. at Philadelphia

ELECTRICAL ENGINEERS from a wide area gathered in Philadelphia the first three days of this week to participate in a program arranged by the Middle Eastern District of the American Institute of Electrical Engineers. The extensive rebuilding and electrification programs of the Pennsylvania and Reading railroads constituted the major portion of the subject matter of one of the sessions. Both railroads gave the visiting engineers an exceptional opportunity to visualize the magnitude of their undertakings in completely electrifying their terminals, yards and main-line trackage in the Philadelphia area.

Hydro-electric power, communication, power-station apparatus and transmission subjects comprised the topics at the other sessions. Much interest was manifested in the demonstration of a noise-measuring apparatus simulating the average ear's characteristics, in an analysis of automatic control of hydro apparatus to establish optimum economy, and in a new system of flexible speed control devised originally for motor-driven power-station auxiliaries. This new (Rossman) method presents several points of superiority over the classic Ward Leonard method and others commonly used. It was described in the ELECTRICAL WORLD of August 16, page 304. Because of the development of a new switching mechanism load-ratio control of transformer voltage was reported to be economically and practically feasible for voltages below 15 kv. and current ratings beginning at 400 amp.

More than 300 registered the first day and this grew to over 500 before the sessions closed. Inspection trips were made to city plants, and on Thursday there was an all-day excursion to Conowingo.

Lehigh Dedicates New Engineering Laboratory

GOLDEN KEYS to the James Ward Parkard laboratory of electrical and mechanical engineering at Lehigh University, Bethlehem, Pa., were intrusted to S. S. Seyfert, professor of electrical engineering, and F. V. Larkin, professor of mechanical engineering, on Wednesday, October 15, as part of the dedication ceremonies of the new building, which was built through the generosity of the late Mr. Parkard, a Lehigh graduate, at a cost of $1,200,000. Charles M. Schwab made a dedicatory address.

The opening ceremonies were to continue on Thursday and Friday, and among the scheduled speakers were prominent educators, industrialists and electrical executives and technicians such as Frank A. Merrick, Matthew S. Sloan, Bancroft Gherardi, Dugald C. Jackson, Dexter S. Kimball and William E. Wickenden.

▼

England Starts Her First 132-Kv. Line

SUPPLY OF ELECTRICITY by the Bedford (England) municipal undertaking to the Beds, Hunts & Cambs Electricity Company is now transmitted at a voltage of 132,000, for which the line, as part of the national grid, was originally designed. This is said to be the first time when current for practical purposes has been carried in England at so high a voltage. Power is fed from the Bedford station to the Electricity Board's transformer station on the outskirts of the city and from there to the line.

▼

Sloan Takes the Stand at New York Edison Hearings

NEW YORK CITY will probably wait until after the election for a decision by the Public Service Commission concerning the rate reduction of $5,000,000 to $6,000,000 offered by President M. S. Sloan on August 1 on behalf of the New York Edison and associated companies. Direct testimony for the company was concluded at a hearing on October 9, when Mr. Sloan read a 74-page statement before the commissioners present.

Reiterating his offer to supply residential energy at 5 cents a kilowatt-hour plus a meter charge of 60 cents, amplifying the reasoning behind it, and answering numerous questions raised at previous hearings in the same case, Mr. Sloan said: "We have welcomed and shall continue to welcome searching analysis and examination of our proposals and all fair comment upon them. It seems proper to say frankly that our proposals should in fairness be viewed and passed upon as a whole. They represent the ultimate of what these companies could do at this time in any justice to either investors or customers."

Mr. Sloan admitted a decline in the demand for energy ascribable to business depression which would make the decrease in revenue more than the $5,000,000 first estimated, but said the company would put up with a temporary loss in order to obtain a simplification of its rate schedule and the introduction of meter-charge and demand-charge features. He answered suggestions that a minimum charge would be preferable to a service charge by saying that even with a monthly minimum bill of $1 it would be impossible to reduce the energy rate to as low as 5 cents and that a minimum charge would disturb the balance between residential and commercial customers. He also said that the companies' proposals were not made with any reference to their effect on submetering.

When hearings were resumed on Thursday of this week, with President Sloan again on the stand, Corporation Counsel Hilly and other cross-examiners endeavored to get into the record some of the information furnished by the company at the time the rate offer was originally made which bore upon the valuation of its property. Chairman Maltbie ruled out the questions on the ground that valuation proceedings were not involved in the present case.

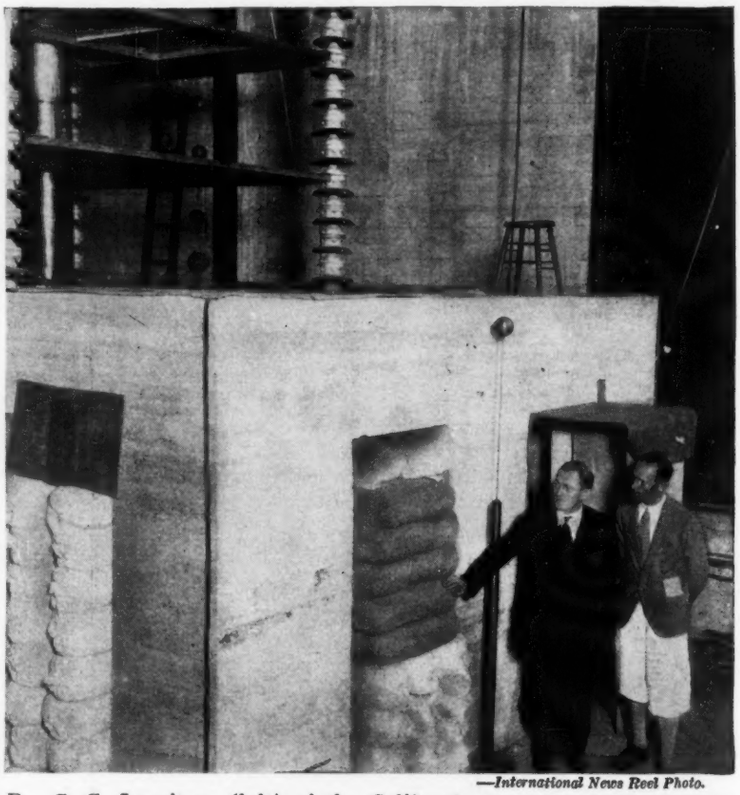
▼

Nashville R. & L. Merger to Bring Lower Rates

MERGER OF THE Nashville (Tenn.) Railway & Light Company with the controlling organization, the Tennessee Electric Power Company, to which the Nashville City Council has just consented, will mean a considerable reduction in lighting rates in Nashville, the power company having agreed to file with the state commission the schedule of rates which is now applicable in Chattanooga.

▼ ▼ ▼

HOME OF "WORLD'S LARGEST" X-RAY TUBE



—*International News Reel Photo.*

Dr. C. C. Lauritsen (left) of the California Institute of Technology, Pasadena, built this excellent imitation of a concrete dugout to damp the emanations of the powerful X-ray apparatus installed in the research laboratory of that institution.

Motor Thrashes Oats at Less Cost than Steam

MIDDLE WEST AGRICULTURAL EXPERTS are said to be asking whether the electric motor will displace the old steam traction engine in the grain fields of that section. In experiments conducted recently by the agricultural engineering department of Purdue University the task of thrashing a crop of oats from one entire farm, using a separator driven by a 10-hp. single-phase electric motor, was accomplished at the rate of 155 bushels of oats an hour all day long.

T. E. Hienton, in charge of the university's department, conducted tests on the power requirements of the machine and found the cost to be considerably below the cost of coal to operate a steam traction engine. He thinks that, while the use of motors for this purpose still is in the experimental stage, it offers great possibilities where farms are near electric lines. Further studies will be made of the problem by the department with the object of learning the kind and size of motors which will work most efficiently and the cost of operation.

▼

Must Ask Removal of the Connecticut Commission

REFUSAL LAST WEEK BY THE Superior Court of Connecticut to accede to a motion by the Attorney-General of the state for a new trial on the issuance of a mandamus writ requiring him to proceed against the Public Utilities Commissioners will, if sustained in the Supreme Court of Errors, leave the legal officer no option but to ask for the commissioners' removal from office for failure to enforce the grade crossing elimination law.

The Supreme Court previously had upheld the decision in an action brought by Prof. Albert Levitt of Redding to compel the Attorney-General to proceed against the commissioners (ELECTRICAL WORLD, July 19, page 99).

▼

Carrier-Current Talk Reaches 445 Miles

CARRIER-CURRENT COMMUNICATION for regular operating service has been installed between Pine Bluff, Ark., and New Orleans, a distance of 445 miles. This is said to be the longest communication distance ever covered in this way for regular service.

Incident to the construction of a 110 kv. line between Amite, La., and New Orleans, forming the final connecting link in the interconnection between the Market Street plant of the New Orleans Public Service, Inc., and the Sterlington steam plant of the Louisiana Power & Light Company, in the northern part of Louisiana, General Electric carrier-current equipment is used to permit communication between New Orleans and Amite, La.; Jackson and Indianola, Miss., and Pine Bluff, Ark.

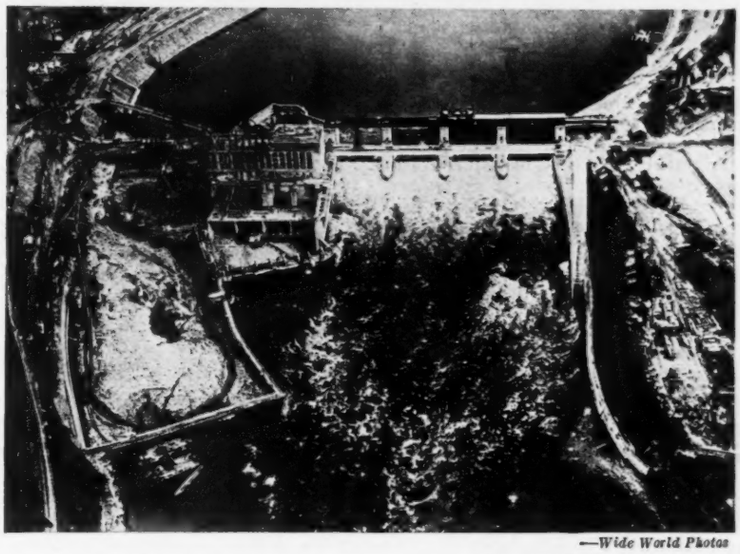
▼

Caldwell Criticises Federal Radio Board

THE FEDERAL RADIO COMMISSION'S recent regulation "preventing half of the broadcasting stations on clear channels from having high power, even though such stations are willing to spend hundreds of thousands of dollars for high-power equipment and thus to serve the public with high-intensity signals, is," according to a recently expressed opinion of former Commissioner O. H. Caldwell, "an example of the commission's absurd struggles to comply with the politicians' behests, even at the cost of public service."

In its present attitude, Mr. Caldwell continued, the Radio Commission is operating directly in opposition to the public interest and contrary to the consensus of all expert and engineering opinion. If high power is good on four channels out of eight in each zone, he says, it is just twice as much in the public interest to have all eight go to high power.

POWER ON THE GERMAN-SWISS FRONTIER



—*Wide World Photos*

The international Ryburg-Schwoerstadt hydro development on the upper Rhine is nearing completion. This aërial view shows the power house on the left. It will have an initial capacity of from 40,000 hp. to 120,000 hp. and a possible ultimate rating of 500,000 hp.

▼ ▼

South Carolina Agitation for Uniform Power Rates

VICE-PRESIDENT W. S. LEE of the Duke Power Company spent much of a day on the witness stand before the South Carolina Railroad Commission at Columbia last week, giving testimony to substantiate his contention that the cost of distribution and transmission is the most important factor in making the cost of electric power more for some manufacturers than for others. The commission's hearing was called to consider a petition of the South Carolina Power Consumers' Association for an order requiring the power companies to charge uniform rates to manufacturing plants.

The case was brought against the Duke company and the Southern Public Utilities Company. Besides Mr. Lee, J. E. Sirrine of Greenville, cotton-mill builder, testified briefly and the power companies rested their case. The petitioners' side was to be heard at a later hearing.

▼

Wisconsin Commission on Latent Water Power

REVERSING ITS EARLIER PRACTICE, the Wisconsin Railroad Commission, which under the state law must value the dam site and the flowage right at any place where a permit to develop water power is sought, has in approving an applica-

tion of the Flambeau Power Company for permission to build a dam on the North Fork of the Flambeau River put no value on the undeveloped water power itself, saying:

> Lands owned by the applicant company but not necessary for the developed project—that is, land other than flowage lands and those upon which the dam, power house and other necessary structures are to be located—are not included in the value. Neither has the commission made any allowance for the undeveloped water power, exclusive of the value of the lands.
>
> The commission states as its opinion that the energy which resides in falling water and which cannot be captured except by means of a dam across the stream is not a property right appurtenant to the riparian lands, but is appurtenant to the dam, which can only be constructed by permission from the state.

▼

Alternating Current for Downtown Columbus

DESIRED PERMISSION has been given by the Columbus (Ohio) City Council to the Columbus Railway, Power & Light Company to proceed with its program of changing its system in the downtown district from direct current to alternating current at a cost estimated at $1,000,000. It is planned to push the work as rapidly as possible so that it will be finished before the Christmas holidays.

▼

Oregon Governor Wants Water-Power Fees for State

GOVERNOR A. W. NORBLAD of Oregon thinks that Congress should amend the federal water-power act to provide for the diversion to the state concerned of the fee of 25 cents per horsepower that is now required of all licensees. He contends that inasmuch as the consent of Oregon must be given before water-power projects can be developed within the boundaries of that commonwealth, all fees for administration purposes attending power applications, permits and licenses should be collected by state authorities.

Governor Norblad is thinking of asking the 1931 Legislature to memoralize the Washington government to act in this matter and may request the Oregon delegation in Congress to assume responsibility. He has decided not to call a special session of the old Legislature to pass water-power laws, despite the importunity of some individuals and civic organizations.

West Coast Company Shortens Its Name

A CHANGE IN THE CORPORATE NAME of the People's West Coast Hydro-Electric Corporation, Portland, Ore., to West Coast Power Company has been made with the object of simplification. The new name is one formerly used by one of the predecessor companies.

▼

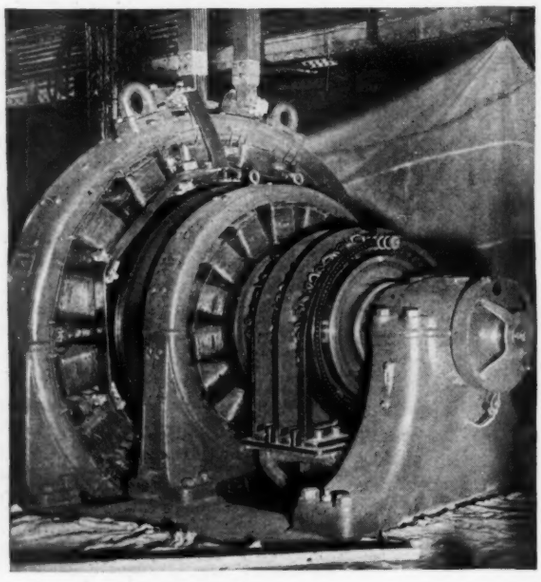
Workmen Busy Already on Rock Island Plant

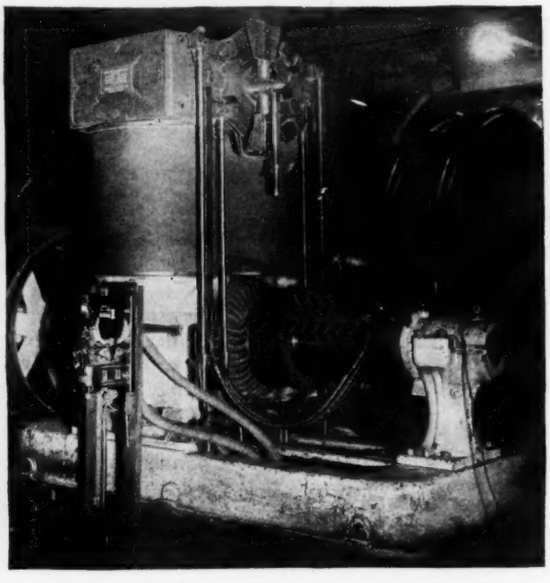
PERMANENT CONSTRUCTION WORK on the Puget Sound Power & Light Company's 240,000-hp. Rock Island hydro-electric project, on which $6,000,000 will be spent this year, has been started a month ahead of schedule, this progress being made possible by the fact that the Columbia River has receded to a point where the bedrock on part of the dam site is dry.

Work has also begun on a 110-kv. transmission system from Rock Island to Everett. The first 80,000-hp. unit at Rock Island is to be ready in 1932. Power will be transmitted to Wenatchee and thence to the Beverly Park substation at Everett.

▼ ▼ ▼

PHILADELPHIA'S FIRST GENERATING STATION ENDS LONG CAREER





A FEW weeks ago the Philadelphia Electric Company's pioneer Edison station, built under the personal supervision of the man whose name it bore and placed in service on March 12, 1889, was formally closed. School, workshop and laboratory in one, costing nearly a million dollars, and first known in the Quaker City as the "giant skyscraper power plant," its original equipment consisted of 20 500-hp. engines on the ground floor with 40 150-kw., two-wire, 110-volt bipolar dynamos on the floor above. One of the latter is shown on the right in contrast with a 2,250-kw. rotary converter, installed in recent years, on the left.

Two of the dynamos were retained for emergency service as late as 1921, and the old boiler room delivered high-pressure steam for heating in a small area near the plant until three years ago, but the station as a whole had seen many changes in equipment during its 41 years of service as its status gradually changed from that of a generating to that of a distributing plant. Its discontinuance was due to the decrease of demand for direct-current energy caused by the company's policy.

Coming Meetings

Rocky Mountain Division, N.E.L.A.—Franciscan Hotel, Albuquerque, N. M., Oct. 20-22. O. H. Weller, Public Service Co. of Colorado, Denver.

National Electrical Manufacturers' Association — Chamberlain-Vanderbilt Hotel, Old Point Comfort, Va., Oct. 20-24. A. W. Berresford, 420 Lexington Ave., New York.

National Electrical Wholesalers' Association—Pittsburgh, Nov. 10-14. E. Donald Tolles, 165 Broadway, New York.

National Association of Railroad and Utilities Commissioners—Charleston, S. C., Nov. 12-15. J. B. Walker, 270 Madison Ave., New York.

American Institute of Electrical Engineers — Southern District, Louisville, Nov. 19-22; winter convention, New York, Jan. 26-30. F. L. Hutchinson, 33 West 39th St., New York.

▼

New Power Stations and Transmission Lines

EVERYTHING WAS IN READINESS for the formal opening of the James H. Reed generating station of the Duquesne Light Company on Brunot Island on Thursday of this week. The initial installation is one 60,000-kw. turbo-generator and three boilers. This equipment, costing $10,000,000, can be duplicated in the present building. An ultimate rating of 240,000 kw. is planned at a cost of $40,000,000.

On the following day, as announced last week, Plant Atkinson, the Georgia Power Company's new 75,000-kw. steam power house near Atlanta, was to be dedicated.

Placing in operation of a 60,000-kw. generator on October 8 increased capacity at the Lakeside power plant of the Milwaukee Electric Railway & Light Company to about 300,000 kw. The new low-pressure unit was built by the Allis-Chalmers Manufacturing Company and is a duplicate of one installed more than a year ago. Additions to the plant now near completion have cost about $4,200,000.

The Puget Sound Power & Light Company issued invitations to stockholders and friends of the company to attend a "preview" of the Shuffleton 70,000-kw. steam plant at Renton on October 5 and 6. This is the first unit of the company's projected 210,000-kw. plant, which will serve as an emergency unit for its whole system. The power house is 240 ft. long by 172 ft. wide and 88 ft. high, with the three stacks rising 60 ft. above the roof. Two 35,000-kw. General Electric turbo-generators are operated at 400 lb. pressure and 750 deg. F.

The third 49,000-hp. unit of the Waterville (N. C.) hydro-electric plant of the Carolina Power & Light Company on the Pigeon River has recently been put into operation, bringing its total rating to 147,000 hp.

The first wheel of the hydro-electric project of the Lexington Water Power Company on the Saluda River near Columbia, S. C., was turned on September 29, when a test was made on unit No. 2. Unit No. 1 was tested the following day. Both preliminary tests were highly successful. The other two units of the four to be installed will be completed about November 1. These are vertical-shaft, Francis-type turbines, each developing 55,650 hp. at full gate at 180 ft. net head. Each generator has a capacity of 40,625 kva. at 80 per cent power factor.

Construction of two additional units in the Deepwater plant of the Houston Lighting & Power Company will be completed early in 1931 and will give the plant a total capacity of 150,000 kw. An extension of the company's power transmission system will also be made. The Houston company serves 73 communities of south Texas.

Formal opening of a new 6,400-kw. power plant of the Panhandle Power & Light Company, 4½ miles from Mobeetie, took place October 4. Transmission lines from the plant will serve towns in the upper Panhandle of Texas and western Oklahoma.

Increase of generating capacity at the Ozark Dam development of the Empire District Electric Company, Joplin, Mo., now under way, will raise the rating to 27,000 hp., at a cost put at $1,750,000. The work is likely to be complete about January 1.

A new switching station is being completed at Gere's Lock, just west of Solvay, N. Y., that will more completely than ever link Syracuse with the great power sources of that state. This station will be a junction and switching point for power lines from Niagara Falls on the west, the numerous hydro-electric developments of the Adirondack Mountains and the St. Lawrence Valley on the north, and the Adirondacks on the east. The purpose is to provide facilities for an increased supply of 60-cycle power, in furtherance of the plan now under way in northern New York to change all 25-cycle equipment to 60-cycle.

The El Paso (Tex.) Electric Company has under construction a 66-kv. transmission line between El Paso and Las Cruces, N. M. It will cost approximately $340,000.

Construction of a 220-kv. transmission line from the Powerton generating station of the Super-Power Company of Illinois at Pekin to the intersection with the Chicago Sanitary District Canal at the Chicago city limits has been authorized by the Illinois Commerce Commission.

The Indiana Electric Corporation, an Insull subsidiary, is to construct a 132-kv., 50-mile transmission line from Indianapolis to Newcastle, Ind., now served by a 66-kv. line coming from Knightstown and by lines of similar voltage from Cincinnati and Kokomo, Ind.

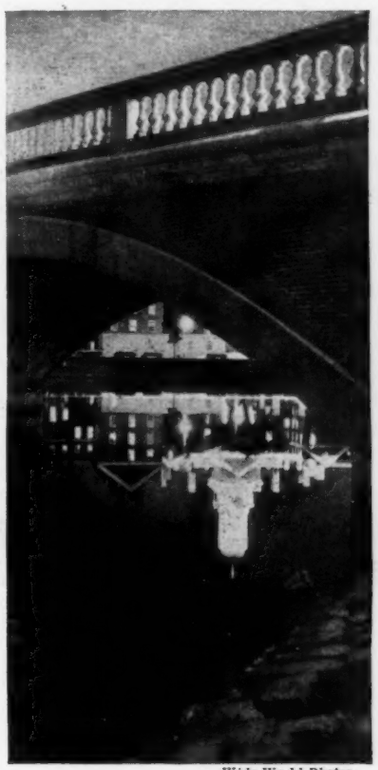
A 54-mile power line between Cumberland, Wis., and Pine City, Minn., has been completed by the Wisconsin Hydro-Electric Company of Amery.

Construction of a 70-mile 88-kv. steel-pole power line to connect the Palo Verde Valley with the main transmission system of the Southern Sierras Power Company at Calipatria, Calif., has begun. The line is to be completed by January 1 next.

Completion in October is assured of the Pacific Power & Light Company's 80-mile 110-kv. transmission line between the Yakima Valley in Washington and White Salmon, Wash. This line, built through a rough mountainous district, has cost $1,000,00. It will be operated at 66 kv. until next year.

▼

HOW CHARLES RIVER MIRRORS LIGHT

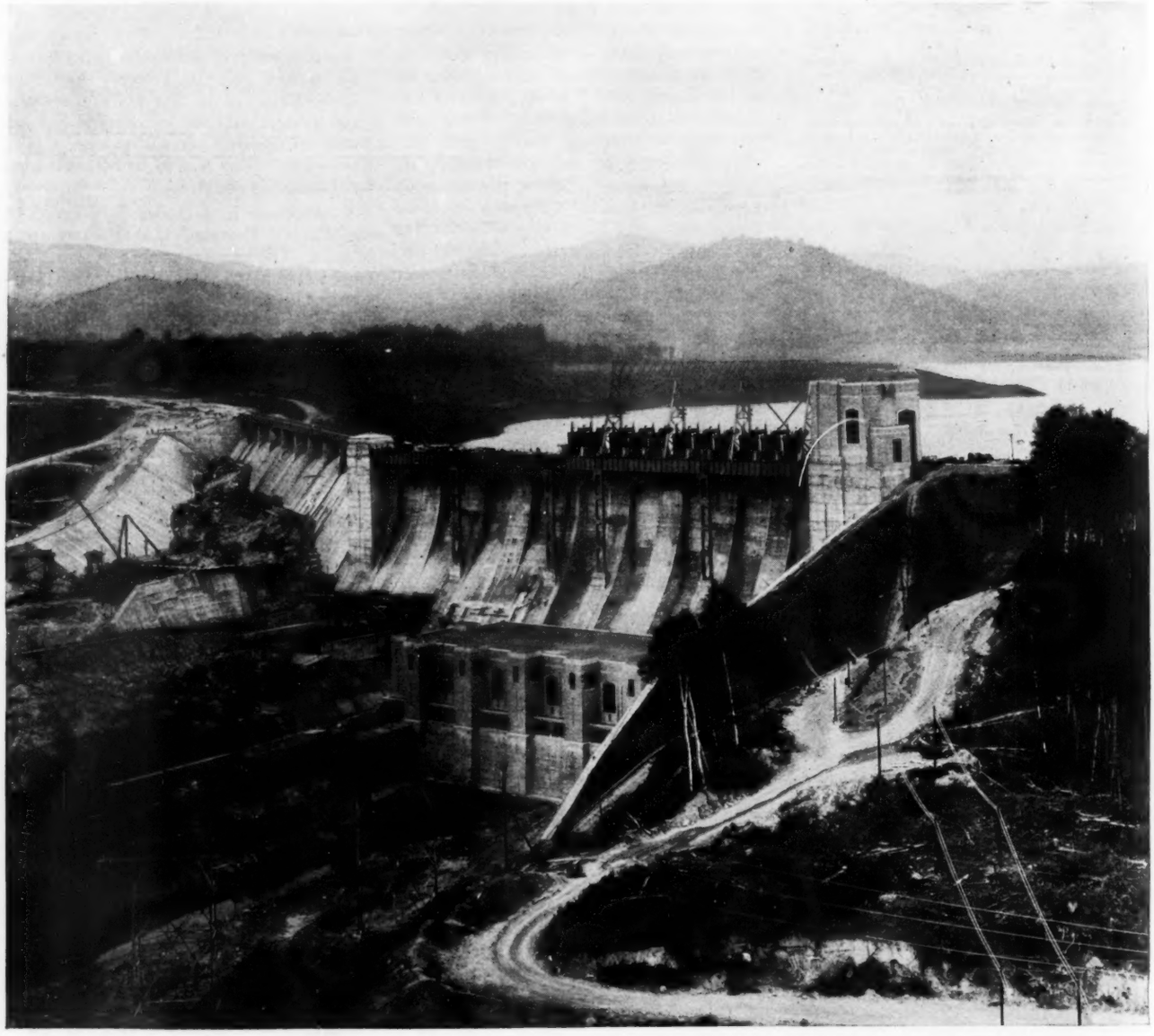


—*Wide World Photos.*

Looking at night through an arch of the Weeks Memorial Bridge over the Charles River to Cambridge, one gets this reflection of the new Dunster Building of Harvard University.

FIFTEEN-MILE FALLS

—200,000 Hp. for New England's Power Resources



WHEN President Hoover, at the White House, pressed a silver key on the last day of September, the new 156,000-kva. plant of the New England Power Association on the upper Connecticut River began delivery of energy to the system of that association. A 13,200-kva. regulating development is under construction below "15" and an upper project of 120,000 kva. is planned.

EDITORIALS

L.W.W.MORROW
Editor

Political arena opens

EACH fall the politicians bait the utilities in an endeavor to appeal to the voting audience. Unfair, unwise and impracticable pronouncements are made in the hope that votes will thereby be gained. The arena has been entered as usual and the baiting is going on in several regions. Georgia has its Crisp County, Arizona its Boulder Dam, New York its water powers, Pennsylvania its Pinchot, Oregon its agitation for municipal ownership, and other states their own local barbs. These things have been for many years and will continue to exist. Conditions, however, are better this fall than in previous years.

Little is gained by the utilities if they attempt to bandy words with the baiting politicians. False statements should be controverted, and no concessions should be made to expediency, but there is small profit from entering into debate with the man who is seeking office on the plea that he will protect the public against the nefarious power trust. He does not wish to be educated. The utility that has merited public approval by its work over a long period will suffer no injury from the darts thrown in the political arena. The judgment of the voters may be trusted. They will not jeopardize the health of utilities that have rendered them good service.

Sparking in Air

NOTHING could better illustrate the refinements which are now necessary in electrical research, and in the theoretical analysis of the results thereof, than the discussion now under way in the literature of physics and electrical engineering on the mechanism of the electric spark in air. For a number of years now it has been assumed that Townsend's theory of secondary ionization would account for all the ordinary manifestations of sparking. However, while the theory is amply substantiated for low gas pressures, it has never been completely harmonized with experimental results at atmospheric pressure. In fact, it has not yet been possible to account for the well-known value of 30 kv. per centimeter for the breakdown between parallel plates, and difficulty has been found in accounting for the experimental values of the time lag of the spark beyond the application of voltage. The refinement of measurement made possible in the use of the cathode-ray oscillograph is giving certain information as to the value of this time lag to the order of accuracy of 10 micro-seconds or so, and it is differences of this order of magnitude which are being looked to to determine whether or not Townsend's theory is sufficient to account for the facts of experiments at atmospheric pressure.

It seems certain that a uniform field of 30 kv. per centimeter between parallel plates is not in accord with this theory, and it has become necessary to add something to it. Here is where the discussion develops into the refined differences provided by the theory. On the one hand, it has been suggested that between parallel plates space charges may develop, due to the motion of electrons and positive ions, and that these space charges may imply regions of local high stress sufficient to account for experimental results and for the local initial sparks which have been revealed by photographic methods. On the other hand, it has been suggested that the first motion of the ions is sufficient to generate high temperature in local regions, resulting in increased ionization sufficient to bring about the initial local sparking. The discussion is as between the rate at which space charges may

accumulate and that at which the high temperature may arise. These questions involve most careful analysis in terms first of the kinetic theory of gases and the thermodynamic relations thereof, as well as of the various experimental evidence now available bearing on the condition under which ionization may occur under the impact of electrons and positive ions. This discussion is noteworthy also for the increasing mutual interest manifested by physicists and electrical engineers each in the problems of the other.

Inducement rates for capital

IN THE long run are not the major tests of an investment in the electric light and power field concentrated in stability of return, purchasing power of capital, wages for participation in the enterprise, and potential or realized appreciation of security values? Such was the thought expressed in a utility office a few days ago during a discussion of a commission order reducing residential service rates on the basis of a stated return on a so-called fair value of plant devoted to this class of business. Out of the comments of the occasion the idea took root in some minds at least that underneath all the ups and downs of material and labor costs, of fluctuations in money prices, shifts in the rate of depreciation and obsolescence, variations in managerial skill and enterprise, the purchasing power of the dollar must finally govern the regulating authority in its findings, even as this same index influences the flow of new funds into the industry or retards their entry into it.

Around the conference table of the power company, which had just been told to gird up its loins afresh for more exacting tasks, it was brought out that so long as commissions allow rates of return on investments sufficient to provide the new funds required the outlook for the industry will be optimistic. Into the determination of these rates of return many factors will enter and weight will be given to far more elements than doctrinaires are willing to admit; but the real pulse of investment merit will be the buying power of the capital wage. Time will reveal whether rate regulation can be simplified by being thus brought to a focus on the screen of dollar purchasing power, but in any event it is a good thing to free industry thinking from overemphasis upon certain aspects of valuation which have fertilized legal controversy at the expense of first-class public relations.

Executive excursion in research a hopeful sign

EIGHTY-ODD industrialists and bankers returned this week from a tour of the research laboratories under the auspices of the National Research Council. They brought back some rather significant impressions. The party included chairmen, presidents and vice-presidents of many prominent organizations, and the fact that these men devoted a week to such a trip just at this time is in itself impressive. They visited laboratories of the American Telephone & Telegraph Company, the General Electric Company, General Motors, United States Air Service, American Rolling Mills, Aluminum Company, Mellon Institute, the National Canners and the Bureau of Standards.

If the part that the laboratory is playing in the progress of these great industries is recognized, they felt, there can no longer be any question as to what research can do. Rather the absolute necessity for research becomes inescapable. For the fact that the electrical, chemical, automotive and steel industries have been most advanced in the application of research does not mean that it is exclusively adapted to these fields and that other industries have fewer opportunities to take advantage of it.

These industries have not done so—that's all. But they can. For research springs from an attitude of mind—a courageous desire to search for the possibilities of scientific progress. It will some day make equally great contributions to the other major industries and to agriculture. Enlightened manufacturers in every line will establish their organizations, not in three divisions as at present, but in four—finance, production, sales and research.

All this is clearly on the way, and behind this evolution will also come another change. It will

be but a further practical extension to the field of economics and market development of the principle that underlies both engineering and pure science research. For the research method, the laboratory approach, rests on the simple precept that it is better to explore and find the facts than to rely upon tradition and conjecture. It is as applicable to the behavior of people in the mass as to the reactions of metals. It will achieve a science in business no less than in production. It waits only upon the vision and the courage of the banker and the executive who must give authority.

What price steam economy?

IT WOULD be well for some one to offer a prize to be presented to the steam-plant operator who does not claim the highest economy in the world in this or that. Almost every week a report comes in that some power house has made a record in something or other. While the competition among operators for maximum economy is very laudable and has produced wonderful improvements, it must not be forgotten that in the last analysis there are only two things that count —total cost of energy delivered to customers throughout the year and time lost by shutdown.

One president of a holding company controlling important groups of utilities remarked: "I am not interested in the B.t.u.'s. I want to know what it costs me to give a customer a kilowatt-hour, and I want the power houses to run all the time. One shutdown will sometimes cost more than all the B.t.u.'s saved in a year." Although it is important to save coal, it must be remembered that the coal may be only 30 per cent or so of the total cost, so that a saving of 10 per cent on coal may be only 3 per cent of the total of generation and only a very small fraction of 1 per cent of the cost of energy delivered to the customer. If the additional equipment required for the saving just offsets this 3 per cent, there is really a loss instead of a saving, even if the cost of generation is the only thing considered, because the additional equipment is likely to cause additional shutdowns.

It is becoming more and more important not to consider one steam plant as an independent unit, but to regard it as a part of a whole system and to give out economy values not as related to the individual power house but in percentage terms of the cost of energy delivered to customers. It may then be found that many complications which were introduced in steam plants to produce economy really produce a loss when the system as a whole is considered.

Mercury-jet wave rectifier now a commercial success

SUPPLANTING with a rapidity little short of amazing the firmly established motor-generator set and rotary synchronous converter, mercury-arc rectifiers have on their merits taken over a generous part of the direct-current production for railway supply and industrial purposes both here and abroad. Their successful development has changed to a marked degree the standards of railroad electrification and has brought new economies in operating practices and improved performance. This equipment is not necessarily ultimate, however, for a new contender for the task of producing direct current appears in the now commercially successful mercury-jet wave rectifier, of which several installations have been made abroad.

Notable among the recognized advantages of the jet wave device are high efficiencies in the range from half load to 20 per cent overload, freedom from necessity for water or air cooling, continued operation under many short-circuit conditions, and simplicity of parts and adaptability for mass production.

Action of the mercury-jet wave rectifier depends entirely on mechanical rectification through a moving wave of mercury. Interesting as a theoretical proposition, Dr. Hartman's continued research of about a quarter century finally yielded this successful commercial result as practical difficulties were ironed out. The largest single unit to date is a 200-kw., 550-volt device operating on street-railway service in Copenhagen. Together the mercury-jet wave rectifier and mercury-arc device may do startling things in a field which a few short years ago seemed as ultimate and unsusceptible to change as any that might be selected.

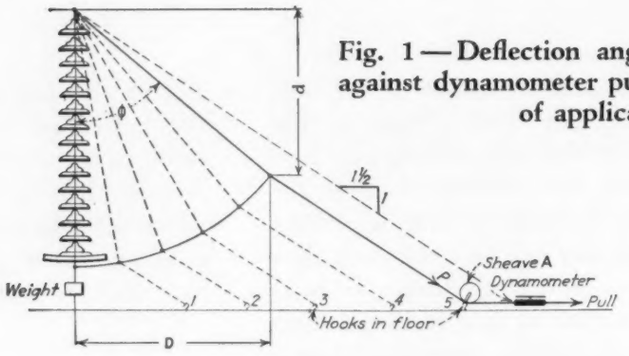


Fig. 1—Deflection angles were measured against dynamometer pull at various points of application

Controlling the Deflection of Suspension Insulators

FULL STRAIN TOWERS are 3 miles apart on the 220-kv. line of the New England Power Association connecting the Fifteen-Mile Falls development with Tewksbury, Mass. The prevention of fifteen-disk insulator swings beyond the selected maximum angle of 45 deg. presented a problem difficult to solve by computation alone. The best approach to a satisfactory solution was through dynamometer tests on the floor.

THE purpose of this article is to make available to transmission-line engineers certain experimental data on the subject discussed in the November 16, 1929, issue of the ELECTRICAL WORLD under the title of "Maximum Swing of Suspension Insulators."

These data were secured during the design of the Fifteen-Mile Falls 220-kv. transmission line of the Grafton Power Company, part of the New England Power Association. Intimate knowledge of the very rugged country traversed by the northern end of this line indicated that many cases of "uplift" would be encountered.

On 110-kv. lines this condition has commonly been taken care of by the use of strain towers at such locations. However, on higher voltage lines good design seeks to eliminate dead-end construction as far as possible. The line above mentioned will have full strain towers only at intervals of 3 miles. It was therefore necessary to develop some means of providing extra weight on those insulator strings which might swing beyond the maximum angle of 45 deg. used as the basis of determining the configuration of our towers.

As a preliminary step in the development of a design for this purpose it seemed desirable to know under just what conditions excessive transverse deflection of the insulator string would take place in any given span. It was recognized that the weight of an insulator string of fifteen disks with grading rings would retard deflection materially. The exact effect of this retarding action seemed difficult to approximate by analysis, for which reason the tests described below were undertaken.

Fig. 1 illustrates diagrammatically the manner in which the tests were performed. The test loads were applied in the approximate plane of the resultant load on the wire in order to determine the angular deflection of the insulator string for certain known conditions.

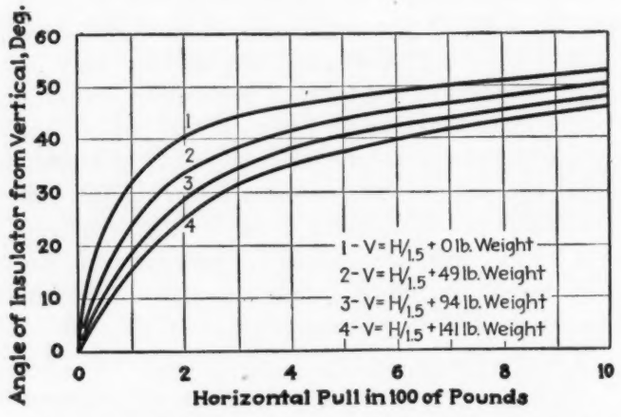


Fig. 2—Relation between horizontal pull and insulator angle

By

C. A. BOOKER

A. E. HILL

Engineering Department,
New England Power Association

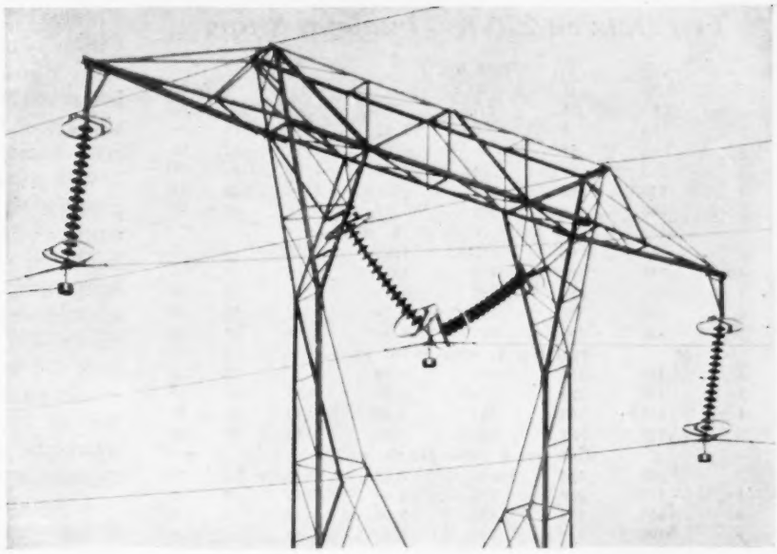


Fig. 3—Swing held to low value in heavy windstorm by extra weight

Since it seemed probable that corrective measures would take the form of external weights attached below the suspension clamp, four series of tests were made with 0, 49, 94 and 141 lb. of extra weight respectively. It was figured that 25 lb. of weight was necessary at the bottom to balance the effect of wind on the insulator string. Compensation for this was made by using a ring in the test assembly which weighed 25 lb. less than the ring in actual use on the line.

The results of the tests are shown in the table. In this tabulation proper adjustments are made in columns "H" and "V" for the horizontal and vertical components of the pull "P," as well as for the extra weights at the bottom of the string. Fig. 2 also shows these results in graphic form.

These forces were translated into terms of span length, the form which is most useful when locating structures on a profile. This was done by progression through a series of curves as follows:

1. Actual weights were substituted for the expression "$V = \frac{H}{1.5}$ plus weight" shown in Fig. 2.

2. Length of conductor of equivalent weight was then substituted for actual weight.

3. The horizontal pull (or wind load) was then converted into length of span by dividing the actual load by the wind pressure per lineal foot. In this case the pressure used was 0.729 lb. per lineal foot, or the equivalent of 8 lb. per square foot on the bare wire.

4. The values of span length for horizontal load where each of the last-mentioned curves crosses 45 deg. were then plotted as abscissas against ordinates consisting of the values of span length for vertical load. This resulted in the curve shown as Fig. 4, which is the working sheet used when spotting towers.

This curve shows the minimum length (or weight) of conductor necessary to limit the insulator deflection to 45 deg. In case the length of wire between the apexes of two adjacent catenaries lies above the curve at the abscissa for the combined length of the two spans, it is necessary to make up the deficiency in weight. Determination of lengths A and B, Fig. 4, is made with a curve corresponding to the sag in the bare wire at 0 deg., and in this case one pound is added for each foot of such deficiency because the wires weigh almost exactly one pound per foot.

We have found it expedient to supply such extra weight in the form of 10-in. cast-iron disks $2\frac{1}{2}$ in. thick, each weighing approximately 50 lb. These, in multiples sufficient to make up the deficiency, are hung below the suspension clamp from a stirrup attached to the cotter bolt of the clamp in such a way that the functioning of the clamp itself is not affected.

Fig. 3 shows an installation requiring 100 lb. of extra weight, the view being taken during a heavy windstorm. When spotting towers, each span is investigated for any

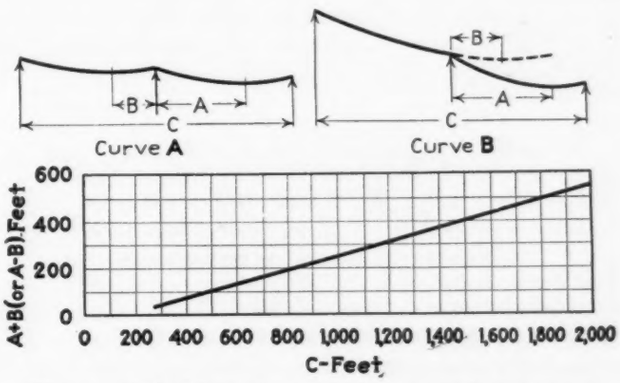


Fig. 4—Working sheet used in spotting towers

NOTE: The basis for these data is that suspension insulator assemblies shall be limited to 45 deg. deflection from the perpendicular when bare conductors are subject to 8 lb. per square foot wind pressure.

Ordinates to the curve represent the minimum conductor weights necessary to limit insulator deflection to 45 deg.

If $A + B$, curve "A," or $A - B$, curve "B," in feet is equal to or greater than the ordinate to the curve at abscissa C feet no additional weight is required.

If $A + B$, curve "A," or $A - B$, curve "B," in feet is less than the ordinate to the curve at abscissa C feet the deficiency of the ordinate in feet must be supplied by adding 1 lb. external weight for each foot of deficiency.

Test Data on 220-Kv. Insulator String

Reading	*P* Lb.	*H* Lb.	*V* Lb.	*D* Ft.	*d* Ft.	φ Deg.	φ Min.
Test No. 1							
1	10	8	6	1.92	7.94	13	36
2	65	54	36	3.09	7.54	22	18
3	115	96	64	4.22	6.98	31	08
4	350	292	195	5.78	5.90	44	35
5	700	583	389	6.17	5.46	48	30
Test No. 2 (with 49 lb. wt.)							
1	60	50	82	1.85	8.03	13	0
2	110	92	110	2.95	7.64	21	6
3	180	150	149	4.14	7.11	30	10
4	360	300	249	5.14	6.42	38	40
5	960	798	581	6.19	5.48	48	30
Test No. 3 (with 94 lb. wt.)							
2	165	137	186	3.04	7.50	22	3
3	250	208	233	4.02	7.17	29	15
4	485	403	363	5.10	6.42	38	29
5	915	761	601	5.85	5.83	45	05
Test No. 4 (with 141 lb. wt.)							
2	180	150	241	2.94	7.56	21	15
3	312	260	314	4.03	7.12	29	33
4	605	503	476	5.06	6.48	38	0
5	1100	915	751	5.81	5.83	44	55

tendency to uplift, and by the judicious use of extensions and proper choice of dead-end locations it has been possible to keep the number of installations of weights down to about 50 in a line having 2,300 towers. No location has as yet been found to require more than four cast-iron disks or 200 lb. of extra weight.

▼ ▼ ▼

Power-Factor Correction for Neon Signs

KNOWING that the inherently high reactance transformers necessary for neon signs gave rise to very poor power factor and would eventually cause serious loss of distribution transformer and copper capacity, the Portland (Ore.) General Electric Company (formerly Portland Electric Power Company) started an investigation two years ago to determine the power factor of neon signs and to ascertain what could be done. This investigation included a series of tests on straight neon signs with various combinations of gases as well as on combination neon and incandescent lamp signs.

Out of 48 neon signs tested in one investigation the average sign required 600 watts energy and 1,330 volt-amperes, making the average power factor 45 per cent. Eighteen signs in another test had a total load of 8,546 watts and 20,013 volt-amperes with an average of 475 watts and 1,112 volt-amperes, making the average power factor 42.7 per cent. A thousand such signs would draw only 475 kw. of energy from the distribution system, but would require 1,112 kva. of circuit capacity. Considering system losses, about 1,400 kva. in generator capacity would be needed. Simply stated, 3 kva. of generator capacity would be required for each kilowatt of sign load.

The most complete survey was completed July 1, 1930, and gives data for a total of 941 signs on this system. Results will be found in one of the accompanying tables. From this it will be seen that the average power factor for all signs, including 330 combination neon and lamp signs, was 51.9 per cent. For 611 straight neon signs the power factor was 44 per cent and for the 330 combinations signs 68.1 per cent. A series of tests conducted with and without a 50-mfd. condenser connected to the primary of the sign transformer also is shown in tabular form. This test shows quite clearly the corrective value of a static condenser.

During these tests, which were conducted under the direction of D. W. Proebstel, superintendent of tests, commercial aspects of the problem were being followed up with sign and transformer manufacturers. The whole thing culminated in an agreement between the two power companies serving Portland and vicinity that beginning September 1, 1930, no signs would be installed on the lines of either company that were not equipped for power-factor correction. Sign manufacturers have the choice of using a transformer and capacitor unit now on the market or of connecting a static condenser of proper

Power-Factor Conditions on Neon Sign Circuits

Survey on System of Portland General Electric Company (July 1, 1930)

Total Neon Signs With and Without Lamps	
Total number of signs checked	941
Total volt-amperes	1,334,485
Total watts	693,356
Power factor of total load	0.519
Average volt-amperes per sign	1,418
Average watts per sign	737
Average power factor per sign	0.519
Neon Signs Without Lamps	
Total number of straight neon signs	611
Total volt-amperes of straight neon signs	892,269
Total watts of straight neon signs	392,214
Power factor of straight neon signs	0.44
Average volt-amperes per sign	1,461
Average watts per sign	642
Neon Signs With Lamps	
Total number of signs containing one or more lamps	330
Total volt-amperes of signs containing one or more lamps	442,216
Total watts of signs containing one or more lamps	301,142
Total power factor of signs containing one or more lamps	0.681
Average volt-amperes	1,340
Average watts	913

Value of Static Condenser in Correcting Neon Sign Power Factor

Tube Length in Feet	Primary Voltage	Primary Amperes	Watts	Secondary Current in Milliamps.		Per Cent Power Factor
15.0-mm. "Red Neon" Tube 15,000-Volt, 450-Volt-Ampere Transformer						
55.0	116.5	4.0	237.0	23.5	(without condenser)	50.9
55.0	116.5	2.5	240.0	23.5	(with 50-mfd. cond.)	82.4
61.0	117.0	3.75	238.0	22.0	(without condenser.)	54.4
61.0	117.0	2.25	238.0	22.0	(with 50-mfd. cond.)	90.4
47 0	116.8	3.5	184.0	20.0	(without condenser)	45.0
47.9	117.2	2.0	187.0	20.0	(with 50-mfd. cond.)	79.6
15.0-mm. "Red Neon" Tube 12,000-Volt, 350-Volt-Ampere Transformer						
40.5	116.0	2.4	156.0	17.0	(without condenser)	56.0
40.5	116.0	1.5	157.0	17.0	(with 50-mfd. cond.)	89.7
15.0-mm. "Mercury Vapor" Tube 5,000-Volt, 350-Volt-Ampere Transformer						
110.0 in.	117.0	1.3	51.0	23.0		33.6
(No condenser of proper size on hand.)						

capacity across the circuit feeding the primary of the sign transformers. Either method will accomplish the desired results and raise the power factor to 85-90 per cent. It is said that the cost of the transformer will not be increased more than 15 per cent, and since the cost of transformers usually does not exceed about 10 per cent of the cost of the sign, no great hardship will be placed upon either the sign manufacturer or the customer.

▼ ▼ ▼

Meters Stored and Transported on Unit Racks

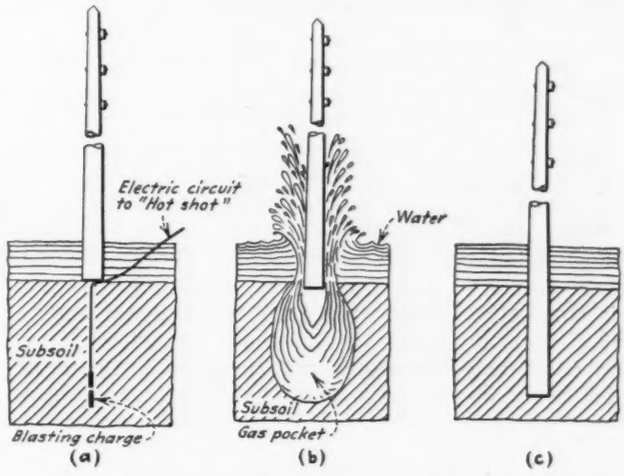
TO CUT down handling labor and save time in transporting watt-hour meters around the stockroom and laboratory in the new service building of the Hartford Electric Light Company 20 special racks have been built for use as units either in stacking or in local trucking or crane transfer. Each rack holds 30 single-phase meters of the usual residential ratings and weighs, light, 47 lb. 3 oz. Fully loaded, a rack weighs 353 lb. The rack unit is 3 ft. high, 15 in. wide at the bottom and 14¼ in. wide at the top, its length being 3 ft. The frame is composed of electrically welded angle-irons (top and bottom members, 1-in. angles; vertical end members, 2-in. angles), surmounted by a bar 6 in. in maximum width and $\frac{5}{16}$ in. thick. This bar is provided with hinged ends, lugs and hooking rods to facilitate handling by a 600-lb. hoist serving the stockroom, local floor move-

Special rack units speed meter handling

ment being made easy by using a Barrett handlift truck and unit platform. Three rack units can be stored in one tier for stationary purposes and two units can be readily handled together on the transport system.

Dynamite Sets Poles Efficiently in Soggy Soil

BOTH large and small poles may be set rapidly, efficiently and economically in baffling soils, such as ojus, sand, muck, marl, loam, etc., by the use of dynamite, according to a report of the N.E.L.A.*



Poles set quickly in soggy soil with dynamite

Depth of Hole	Type of Soil	Dynamite, 40 Per Cent Sticks
6 to 7 ft.	Swamp, muck underlying	2½
6 to 7 ft.	Swamp, muck and rock underlying	3
7 to 7½ ft.	Sand and water	3
6 to 7 ft.	Ojus rock (native South Florida)	4 to 5

This table represents a résumé of opinions of superintendents and foremen who have been using this method. The values are general and will vary materially under various conditions.

The position of the blasting charge, the gas pocket created by the explosion and the pole after it has dropped into the hole are shown by diagrams (a), (b) and (c) respectively.

The depth of the water varies, it being shown merely because it is commonly encountered where the dynamiting method is employed.

In setting poles by dynamite a hollow drill (1½-in. pipe is generally used) is driven vertically at the pole location to the required pole depth. The soil is then forced out of the bottom end of the drill with a ram. A "sandpoint" may be used on the head of the drill where the soil is of such texture that it tends to clog the pipe and resist ramming. When the hollow drill has been properly installed the blasting charge is dropped into it and the drill is withdrawn, leaving the charge at the point where the bottom of the pole is to be.

The pole is placed in a vertical position on the surface of the soil directly over the charge. The charge is detonated and the pole drops into the gas pocket created by the explosion. Natural ground and water pressures force the soil solidly around the pole and it is "set."

In the event of heavy water pressure the process of settling into position is very rapid and necessitates speedy work on the part of the construction crew in order to plumb, line and turn the pole to bring it into alignment.

When light poles are being set "pike poles" may be

*"*Construction and Maintenance Equipment and Methods.*"

used for holding and plumbing, but heavy poles (35 ft. and up) require four-way rigging. Poles as large as 110 ft. in length have been set in holes 14 ft. and 16 ft. deep by the use of dynamite.

▼ ▼ ▼

Oscillograph Technique in Lightning Studies

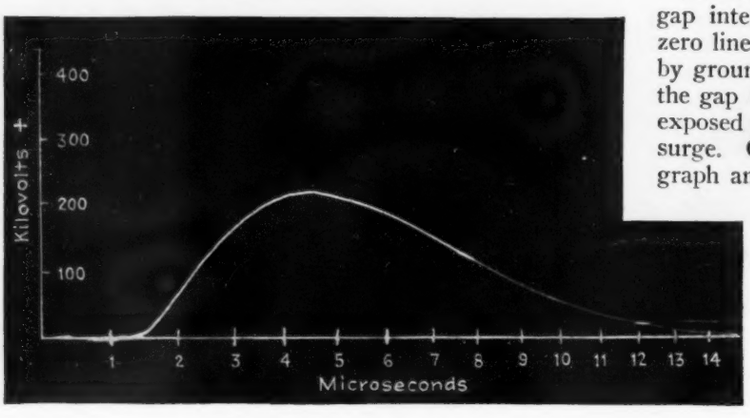
By W. G. ROMAN and E. R. WHITEHEAD

Transmission Engineers Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

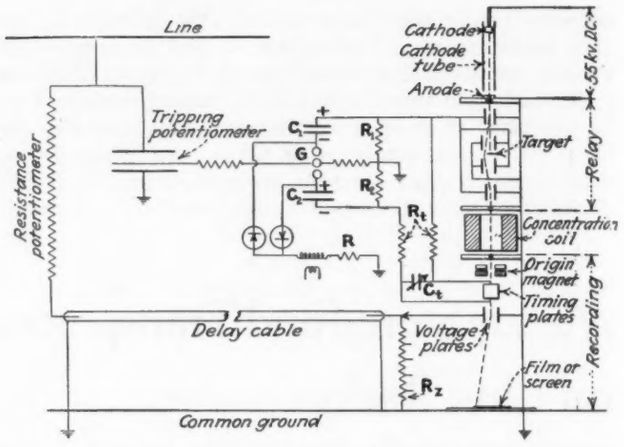
AMONG five oscillograph laboratories of the Westinghouse Electric & Manufacturing Company in the field this year is one operated in conjunction with the Public Service Gas & Electric Company at the latter's Roseland station, near Newark, N. J. This oscillograph is connected to a highly insulated steel-tower line which is not yet in service. Since the line is dead, complications produced by the power voltage are not present and a resistance potentiometer and delay cable can be used for measuring purposes. This results in an accurate and complete record of the surge, including the entire front.

The recording of natural lightning surges on this line is supplemented by artificial surge studies. Both the oscillograph laboratory and the million-volt surge generator used in these tests are portable. The oscillograph used is the Westinghouse cold-cathode type with the modified Norinder relay. The surge generator consists of fourteen banks of condensers charged in parallel and discharged in series. A modified form of the Marx circuit is used, gaps serving as switches in making the series connection. The surges are automatically recorded, and the timing and tripping circuit resets itself after each surge is recorded.

As the surge appears on the line a potential is induced in the center electrode of the three-electrode gap by the tripping potentiometer. This increases the potential across one side of the gap or the other, depending on the polarity of the incoming surge, and causes one of the gaps G to break down. The center electrode immediately assumes the potential of the electrode to which it sparked, and thus the entire rectifier voltage is placed across the other side of the gap, so that it also breaks down. The storage condensers C_1 and C_2 then discharge through the resistances R_1 and R_2. The IR drop in R_1



Oscillograph records the entire lightning surge, including the initial rise



Connection diagram for recording lightning surges on portable cathode-ray oscillograph

The surge voltage through the tripping potentiometer causes double air gap G to break down. The IR drop across R_1 and R_2 deflects the cathode ray around the target by means of relay plates. At the same time the timing condenser C_t is charging at a rate which determines the time co-ordinate. The actual surge is delayed through the non-reactive delay cable until these sequences are complete. A voltage proportional to the surge voltage is applied across the voltage plates by means of taps on the terminal resistance R_2.

is applied to the relay and shifts the beam around the target, as shown by the dotted line. The beam then passes through two concentric holes in the diaphragms on each end of the concentrating coil and into the lower section of the oscillograph, where it impinges on the photographic film.

At the same time, the IR drop across R_1 and R_2 is impressed on the timing circuit, consisting of the condenser C_t and the two resistances R_t. The condenser C_t charges at a known rate which determines the time co-ordinate of the film. The oscillograph is thus prepared for recording the surge.

The inductance and capacitance of the delay cable are so arranged that it acts as a pure resistance and produces no distortion. The cable terminates in a non-inductive resistance equal to its surge impedance. The drop across a suitable section of this resistance is applied to the voltage-deflection plates of the oscillograph and gives a true record of the line voltage. The cable delays the surge about two microseconds, allowing plenty of time for the preparatory tripping and timing sequences. The oscillogram shows this time delay clearly.

As the condensers C_1 and C_2 become discharged, the gap interrupts the circuit and they are recharged. A zero line is placed on the film after the surge has passed by grounding both voltage-deflection plates and tripping the gap G manually. The film is then turned to an unexposed portion and the oscillograph is ready for another surge. Only one man is required to operate the oscillograph and to record data.

A National Viewpoint of Utility Problems

By W. A. JONES*
President National Electric Light Association

SPEED, size, change and mystery always attract attention, and surely it has been so in the electrical industry. This attention has manifested itself both in a constructive and a destructive manner. On the constructive side these qualities have caught and held the imagination of great leaders who might have soon tired of a business of small proportions, less mobile, and completely understood. Many of the great minds who have devoted years of their time to research in the electrical field, and who are still virile and active, would long since have ceased their labors had they felt that the last mystery had been solved, and that nothing remained except to make improvements in efficiency which come through finding a new method of applying old scientific knowledge.

Millions of investors who have placed their capital at our disposal would have long since turned to other lines of endeavor but for the fact that in speed they have seen service, in size they have seen strength, and in change they have seen progress.

Turning for a moment to the destructive forces, we have heard false prophets, speaking out of the fullness of mental confusion or the wilderness of complete misunderstanding, who tell us that our industry and our service have fallen far short of what they might have been under government control. These prophets have viewed with alarm the speed with which we have grown and have characterized this growth as of the mushroom variety. As to our size, they have compared us to a great octopus that is sapping the vitals of the economic and social order. They have charged that the rapid changes in our business were designed to confuse and that the mystery was unnecessary.

Under the barrage of these indictments, the industry, for the most part, has stood mute and continued to expand and extend its service. The time has come, however, when, as an industry, we can no longer afford to disregard the attacks of the critics, who have now become so numerous, and unfair and unjust, that if we allow them to go unchallenged we cannot continue to enjoy public confidence, which is so necessary to our growth and development.

There are two schools of thought within the industry that tell us how we should meet these critics. One school holds that a complete answer is to be found in pointing out to the public the incompetence, selfish motives and, in many cases, the complete insincerity of the critics themselves. The other school believes that the answer to our problem in public understanding lies in a more general dissemination of important factual information about the light and power business. I belong to the latter school.

While I do not urge that we should ever let the demagogue or politician challenge our integrity, I do feel that much more can be accomplished by cool reasoning with an intelligent public than by heated argument with an uninformed critic. For this reason I commend to you light and power men the use of reason and the further distribution of fundamental facts about our business in the interests of a better public understanding.

There are two important facts which should be carefully presented to the public. The first has to do with the cost of our service and its importance as compared with the other items of the family budget. During the year 1929 the total revenue received from domestic sales amounted to $604,000,000, which represents $5 per capita or 1.4 cents per day. This item represents but 1 per cent of the household budget of the American family, and when considered in the light of other expenditures is of little consequence. For example, the per capita tobacco bill of the United States is $16.50; the per capita candy bill is $8.50; the per capita ice cream bill is $8; the cost of food per capita is $182 per year; the tax bill per family in 1929 was $460.

**Excerpts from address before New England Division of N.E.L.A.*

These comparisons lead us to some observations:

1. Those having to do with the commercial development of our business need not fear that they are approaching a point where they are taking an undue proportion of the family income.
2. It is hard to believe that the American public is as vitally interested in the further reduction of lighting rates as it is in a downward revision in the cost of some of the other items in the family budget.
3. So long as the cost of government is equal to fifteen times the total annual bill for electric service in the home there should be no justification for the further encroachment of government in our industry.

This last observation takes on particular significance when we consider that the National Industrial Conference Board recently reported, after a most searching analysis of government expenditures, that "More than a half billion dollars, or more than one-tenth the total cost of the local governments in the United States, represents waste that could be saved each year without diminution either in quality or quantity of the government service now rendered."

We have incontrovertible proof that local governments are wasting enough money each year to pay the entire domestic electric bill of the nation.

When the public comes to understand that free electric service would mean a saving of only 1 per cent in the family budget, it is likely to demand that those who profess to be champions of the public interest devote their attention to the wheat, instead of to the chaff in the economic harvest.

The public has come to believe, and I am sorry to say that many within our industry have allowed themselves to share the belief, that our business is a protected monopoly. This belief, as far as the public is concerned, is probably based on the fact that we operate under franchises or permits obtained from the municipalities or other political units. This misconception lies in the fact that, after all, the franchise or permit is nothing but a right to engage in a legitimate business, which right should be inherent to all of us.

The light and power companies are in no way protected from competition, in the broader sense. More than 80 per cent of their energy output is sold for power purposes, in almost every instance in direct competition with other forms of power, which could and would have been supplied by the user of the power but for the fact that the light and power company could give him a lower rate and better service than he himself could provide.

Perhaps the most striking example of the failure of the so-called protected monopoly theory is to be found in a related industry, the street railway business. Twenty-five years ago this was a flourishing industry. Its credit was splendid. It was allowed to earn a reasonable return on a prudent investment used and useful in the business; but that did not mean a protected monopoly. The habits of the people changed. A new form of transportation came and millions of people who had used the street railway took a bus or a jitney, or rode in their private cars, and the street railways of the country went into bankruptcy by the score. Millions of dollars of hard-earned capital were lost by thousands of investors. The protected monopoly theory in this case did not protect the street railways.

The light and power business stands today in somewhat the same position the street railway occupied 25 or 30 years ago. Then that utility supplied the most popular form of urban and interurban transportation service. We now furnish the most popular form of lighting and power service, and because of the high quality and flexibility and the low cost of our service we have outstripped our competitors in both the lighting and the power field.

However, we must not be lulled into a feeling of security because of this fact. Tomorrow, or the day after, some man, now unknown to the world of science, may discover a new truth and find some new way of harnessing the forces of nature to produce a superior form of energy for light and power.

When this time comes the electric lamp will pass as did the whale-oil lamp, the kerosene lamp, the tallow candle and the gas jet. When this time comes the protected monopoly theory will be no more effective in our business than it has been in the street railway business.

Our future growth and development depend upon the public confidence, for this public must supply the capital we need with which to expand; it must buy our service, and above all else, it will, because of the quasi-public nature of our business, continue to fix the rates and lay down the terms and conditions under which we sell.

In closing, may I leave with you a bit of advice which has come to us from one of the greatest of all Americans. This might have been written specifically for the light and power executives of this country, but its author died seventeen years before the industry was born. The author was Abraham Lincoln. The advice was as follows:

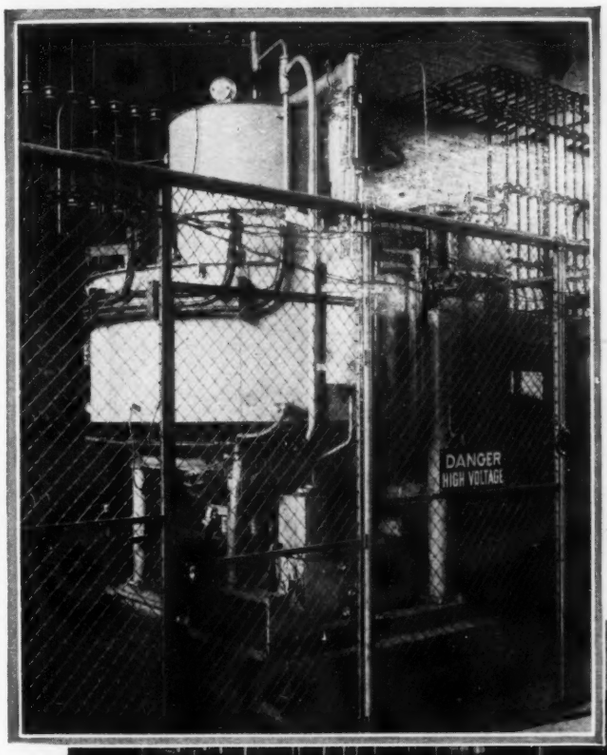
"Public sentiment is everything. With public sentiment, nothing can fail; without it, nothing can succeed. Consequently, he who molds public sentiment goes deeper than he who enacts statutes or announces decisions. He makes decisions possible or impossible to be executed."

▼ ▼ ▼

Power Plants Looked Big a Quarter Century Ago

A COMPARISON of old data for a section of country consisting largely of western Pennsylvania and Ohio with statistics for 1929 relating to the same territory reveals the extraordinary electrical growth that has taken place in this great industrial area.

In 1903 there were in the district under consideration approximately 138 plants with an aggregate capacity of about 68,000 kw. in units of 45 kva. up to 2,500 kva., and only about 9,200 kva. in steam turbines. Twenty-six years later, in 1929, the same territory was served by about 33 systems with an aggregate capacity of some 1,500,000 kw., 85 per cent of it in steam turbines.

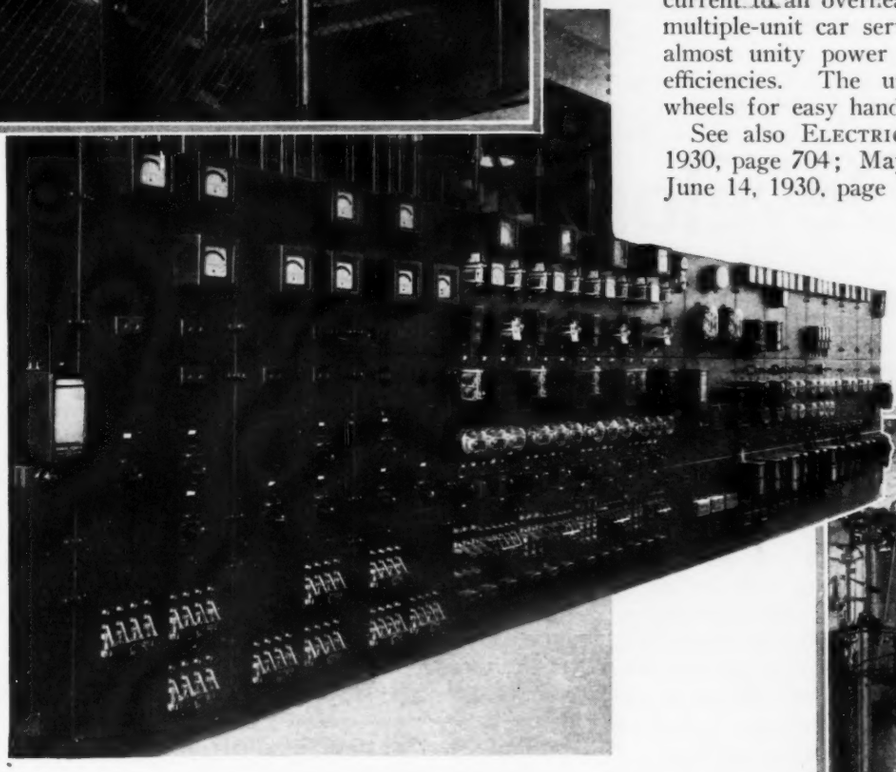


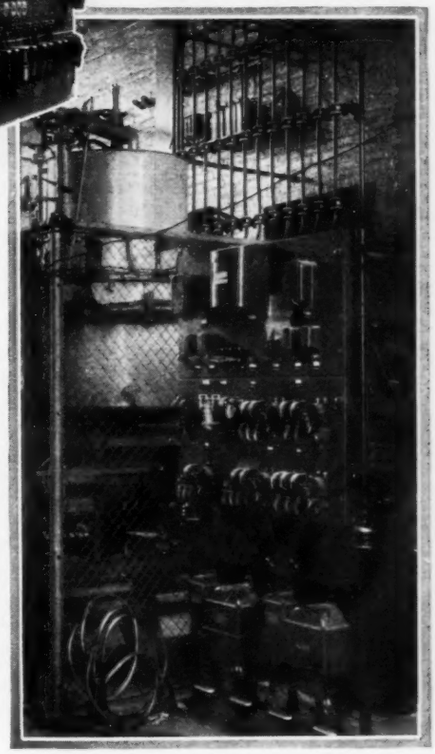
Mercury-Arc Rectifiers Save Railroad Space and Energy

HIGH efficiencies of conversion and reduced space requirements for installation are two considerations which contributed to the decision of the Delaware, Lackawanna & Western Railroad to select mercury-arc rectifiers as the converting means for its recently inaugurated electric operations from the Hoboken terminal.

The rectifiers deliver 3,000-volt direct current to an overhead catenary system for multiple-unit car service. They operate at almost unity power factor and with high efficiencies. The units are mounted on wheels for easy handling.

See also ELECTRICAL WORLD, April 15, 1930, page 704; May 31, 1930, page 1065; June 14, 1930, page 1188.

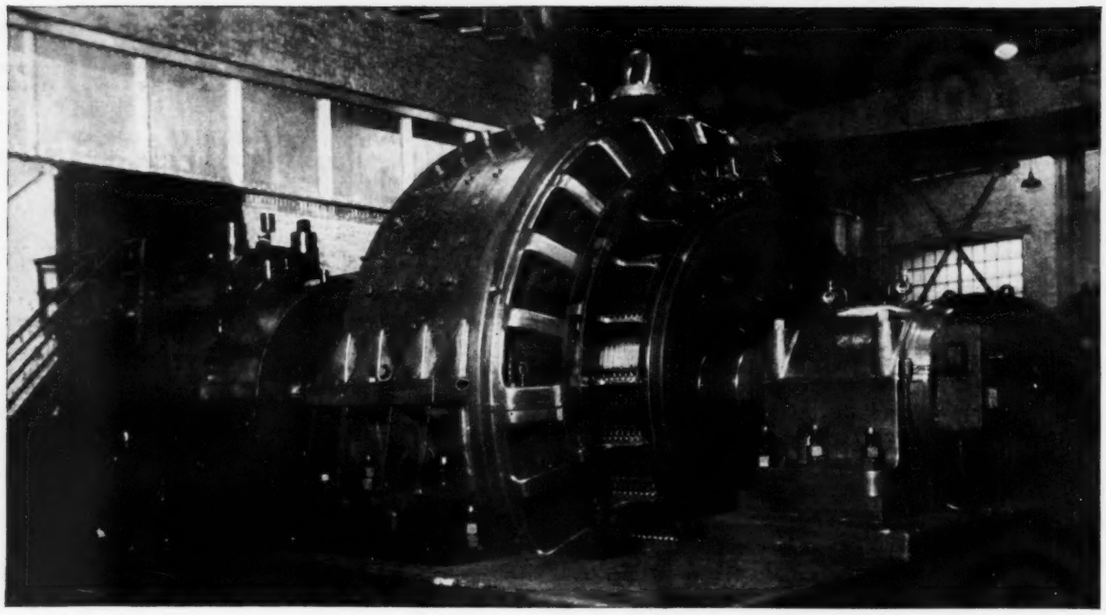




High overload capacity adds to space economies of rectifiers. Four of these 3,000-kw. rectifiers in a Lackawanna substation are capable of carrying 18,000 kw. for two hours or 36,000 kw. for five minutes. (Above.)

Remote-control switchboard for the control of four 3,000-kw., 3,000-volt direct-current mercury-arc rectifiers, nine railway feeders (with space for three more) and auxiliary power circuits for signals and other uses, as well as two high-tension incoming power circuits. All equipment is operated by remote control at low voltage, designed to give maximum safety, flexibility and ease of operation. All the higher voltage circuits which are brought into the ammeters and voltmeters are carried in insulating fiber tubes showing just above the switchboard, while the terminals of these instruments are inclosed in protecting cases behind the board. (Center.)

Automatic control for rectifier auxiliaries. Equipment on this panel controls the operation of cooling systems, vacuum pumps and other rectifier auxiliaries. Transformers at the bottom of the panel insulate the rectifiers and other high-voltage apparatus within the grille inclosure from the control circuits on the main switchboard. (Right.)



7,000-hp., 50/120-r.p.m. reversing motor driving 44-in. blooming mill of Youngstown Sheet & Tube Company

Recent Developments in Steel Industry

By W. H. BURR*

Electrical Engineer Lukens Steel Company, Coatesville, Pa.

APPLICATION of large reversing-mill drives continues. One of the outstanding installations in the past year is that applied to the wide-flange beam mill at the South Chicago works of the Illinois Steel Company. The upper and lower rolls of the 54-in. blooming mills are separately driven, thus eliminating the customary pinion stand, and on the 52-in. universal beam roughing mill the main stand will be driven by one motor and the auxiliary edging stand by a separate motor.

This type of drive eliminates the pinion stand, with its losses and maintenance, and at the same time permits a variation in roll diameter, thus obviating the matching of rolls and permitting flexibility in the mill operation. Twin-motor drive on large mills, such as a 54-in. blooming mill, permits a simpler mill as well as motor construction. This type of mill will require approximately a 10,000- or 12,000-hp. motor. It is obvious that it would be a simpler construction to have two motors driving individual rolls than to develop a single motor driving the mill through pinions.

An important factor in the popularity of synchronous motors has been the improvement in the design which enables these motors to give satisfactory starting characteristics and to be subjected to full voltage during starting. As a result about 60 per cent of the total number of constant-speed motors installed during the year were synchronous motors.

In general, experience has proved that synchronous motors are desirable in any kind of constant-speed mill application where the peak-load conditions are not sufficiently severe to interfere with the satisfactory operation of the power plant.

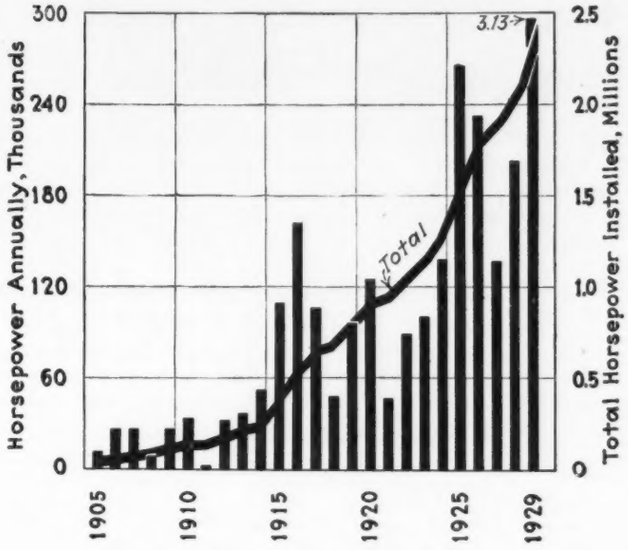
For adjustable-speed service direct-current motors are being used most extensively. A wide-strip mill to be installed by the Illinois Steel Company at Gary, Ind., will be driven by twelve adjustable-speed d.c. motors, totaling more than 20,000 hp. This installation is of especial interest, for it is the first continuous wide-strip mill to use d.c. adjustable-speed motor drives on the roughing stands. Mills previously installed have had the roughing stands driven by a.c. motors. Power for the twelve d.c.

*Based on his report as chairman of the electrical development committee of the Association of Iron and Steel Electrical Engineers, 1930.

motors will be supplied from three synchronous motor-generator sets each of 4,000 kw. capacity at 600 volts d.c. The mill motors will be started and stopped by generator voltage control, eliminating the use of starting resistors and contactors.

Induction-motor drive still has certain applications where it is necessary to utilize the effect of flywheels and where minimum starting current is required. During the year an unusual installation was made where a heavier rolling schedule was desirable. To meet this condition, a second motor, a duplicate of the first, was installed and coupled on the opposite end of the pinion shaft of the reduction gear set.

Another unusual installation is that made at the



Steel industry has 2,370,000 hp. in main roll drives

Manitoba Bridge & Iron Works at Calgary, Alberta, where two concatenated induction motors are used to drive an 18-in. merchant mill and 10-in. merchant mill.

The fabrication of machinery by electric welding of rolled-steel sections, by which were produced the largest alternating-current units last year, this year extended to the largest direct-current equipment.

A byproduct of the change is the opportunity for simplifying designs into a few standard parts, from which many different machines may be made. One

Adjustable-speed direct-current motors in very large sizes are superseding adjustable-speed a.c. sets.

Motor-generators that convert the energy from the a.c. source use synchronous machines if flywheel effect is not needed.

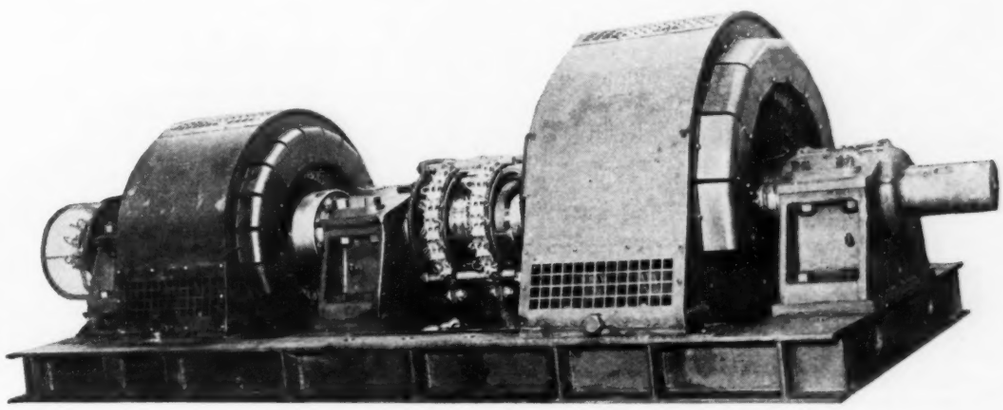
Induction motor sets with flywheels are preferred if load fluctuations on the supply are to be limited.

manufacturer states that 30 widths and thicknesses of slab make 80 different diameters and widths of frame, and these 80 variants replace more than 500 former cast-frame designs. Three different sections of steel produce the brush-holder brackets used for all sizes, replacing some 200 or more patterns of castings. Machines of every size are assembled of parts made from a comparatively few standard drawings; only the windings are separately laid out.

On modern magnetic contactors the magnetic circuit and arc-box side plates are so designed that maximum efficiency in extinguishing the arc is secured. Boxes on contactors which have been in service on a 44-in. blooming mill screw-down eighteen months, controlling two 150-hp. motors, are still in good condition, after more than 7,000,000 operations.

Regulators have been developed for speed-matching control, or the driving of two or more motors at definite speeds, regardless of load, and are being used on both paper-machine drives and steel-mill drives. The general scheme is to have the main motor drive an a.c. pilot generator, which in turn supplies current to the synchronous motor of the sectional regulators. These regulators are adjustable by means of a variable ratio transmission and keep all motors at the correct speed relation.

The year has also seen a considerable acceleration in the installation of photo-electric cells for use as flag switches. The successful operation of the cell has also created other applications, such as direct and recording temperature indicators to replace the present pyrometers, counters for sheets, tubes, billets and ingots, fire prevention, etc. The field of application for this little device is



Concatenated induction-motor drive

1,200/1,200 hp., 900/600 r.p.m., 2,200-volt, 60 cycles, for 20-in. merchant mill of Manitoba Bridge & Iron Works, Ltd.

spreading rapidly, and the demand for photo-electric cells in the steel mills in the next few years will be greatly increased. The design of this apparatus lends itself to practically any application where it is desired to automatize a mechanical operation or adjust an operating condition to obtain increased production.

New installations during 1929 and total horsepower to the end of that year in main-roll drives are as follows:

Type of Mill	Installed Motor Horsepower During 1929	Installed Motor Horsepower Total Including 1929
All types	313,000	2,370,000
Reversing blooming	54,000	275,000
Bar and billet	45,700	300,000
Sheet, bar and skelp	23,500	160,000
Sheet and tin plate	16,000	215,000
Piercing	39,600	140,000
Structural	23,000	240,000
Merchant	35,700	300,000
Plate	4,000	120,000
Rod	1,200	100,000
Strip	70,000	325,000

▼ ▼ ▼

Free Wiring Stimulates Range Sales

TO ATTRACT business at a time when the natural tendency is to retrench and to offer something new in the way of premiums, the Washington Water Power Company tried the plan of wiring ranges and water heaters free of charge during its summer Westinghouse range campaign, which ran from June 16 to August 16. Moreover, it was desired to reach the renter class of potential range customer. Results were surprising and highly satisfactory.

Sales totaled 797 ranges, exceeding the quota of 467 by 160 per cent. Only purchasers of Westinghouse ranges were entitled to free wiring, and of the 798 ranges sold 741 qualified. Of this number the homes of 443 required wiring, other purchasers being given a discount of 10 per cent off the sale price. Of the 443 homes wired free, 107 were rented and 336 were owned homes. The cost of wiring the 443 homes was $16,614.41, or an average of approximately $37.50 per job. Many of these jobs included water heater wiring also. The 10 per cent discount in cases where no wiring was necessary amounted to about half of what it would have cost to wire for a range, so that purchasers already having wiring received a relatively smaller benefit. However, there was no complaint on this score, since it was easily explained that the primary object of the campaign was to wire as many homes as possible. Prorating the total cost of wiring over the total ranges entitled to wiring made the average cost of wiring for all ranges $22.20.

Other features of the campaign were a down payment of only $1 and an allowance of 10 per cent of the amount of the sale for old cooking equipment. Sale price of ranges was the manufacturers' list plus the usual carrying charges for time payments. With the exception of one small bill insert, practically all advertising was done through daily and weekly newspapers. Cash prizes totaling $1,662 were distributed for individual sales records in addition to the regular salesman's commission.

The $16,614 wiring cost was charged to merchandising sales, so that only net merchandising revenue was affected. In spite of this wiring expense nearly 800 ranges and practically as many water heaters were added to the company's lines, increasing gross domestic revenue by approximately $50,000 a year. Total range saturation for the system is now about 27 per cent.

▼ ▼ ▼

Germany Moves Toward Higher Light Intensities

RECOMMENDATIONS for practical illumination intensities for the improvement and modernization of existing lighting systems have been drawn up by the German Illuminating Engineering Society and were recently published in the *Journal of Good Lighting*.

Foot-Candles Advocated for German Schools, Residences, Shops and Traffic Ways

The foot-candles given are one-tenth the recommended lux values. They are based on a reflection of from 40 to 60 per cent from the work or working place.

Working Places, Including Schools

Class of Work	Only General Illumination — Average — Lowest	Only General Illumination — Average — Recommended	Only General Illumination — Minimum — Worst Spot	General Illumination and Local — General — Average	General Illumination and Local — General — Minimum in Worst Spot	Local at Working Place
Coarse	2.0	4.0	1.0	2.0	1.0	5–10
Medium	4.0	8.0	2.0	3.0	1.5	10–30
Fine	7.5	15.0	5.0	4.0	2.0	30–100
Very fine	15.0	30.0	10.0	5.0	3.0	100–500

Residential and Other Rooms

Requirements	General Illumination — Average — Lowest	General Illumination — Average — Recommended	General Illumination — Minimum in Worst Spot
Moderate	2.0	4.0	1.0
Superior	4.0	8.0	2.0
Highest	7.5	15.0	5.0

Traffic Ways

Type of Installation	Average Illumination Lowest	Average Illumination Recommended	Minimum in Worst Spot Lowest	Minimum in Worst Spot Recommended
Streets and Open Places				
With sparse traffic	0.1	0.3	0.02	0.05
With medium traffic	0.3	0.8	0.05	0.2
With heavy traffic	0.8	1.5	0.2	0.4
With very heavy traffic	1.5	3.0	0.4	0.8
Passages and Stairs				
With sparse traffic	0.5	1.5	0.2	0.5
With heavy traffic	1.0	3.0	0.5	1.0
Railway Premises, Shunting Yards				
With sparse traffic	0.05	0.15	0.02	0.05
With heavy traffic	0.2	0.5	0.05	0.2
Platforms, Loading Bays, Corridors and Stairways				
With sparse traffic	0.5	1.5	0.2	0.5
With heavy traffic	1.0	3.0	0.5	1.0
Waterways, Quays, Piers, Locks				
With sparse traffic	0.1	0.3	0.03	0.1
With heavy traffic	0.5	1.5	0.2	0.5
Factory Yards				
With sparse traffic	0.1	0.3	0.03	0.1
With heavy traffic	0.5	1.5	0.2	0.5

Copyright

Samuel Insull

INSULL OPTIMISTIC

Sees utilities weathering depression successfully

"AT THE White House conference called by President Hoover shortly after the panic of November, 1929, I was asked, among others, to present estimates of proposed investment expenditures for the year 1930," said Samuel Insull last week. "The President had in mind the outlook for employment for the coming year. My figures showed that such proposed expenditures by the so-called Insull group of utilities amounted to upward of $198,000,000.

"It is now estimated that the total expenditures by all our companies for the year for plant extensions and the like—chiefly for the wages of labor and for materials—will be between $196,000,000 and $200,000,000. This includes work already done in 1930, work under way and work to be completed by the end of the year.

"This is a very large expenditure of money to be charged to investment account during any year. It is particularly large for a year of general business depression, and these expenditures have a very special significance when consideration is given to the fact that like expenditures by our group were slightly under $147,000,000 in 1928 and slightly over the same amount in 1929.

"It is now estimated that the Insull group of properties will expend between $195,000,000 and $200,000,000 for additions to and extensions of permanent plant in 1931. Expenditures for this year have been, and those for next year will be, spread over 29 or 30 states. However, of the sums given upward of $90,000,000 of the expenditures for 1930 have been or will be in and around Chicago, and it is estimated that upward of $124,000,000 of the 1931 expenditures will be in and around Chicago. The increase in expenditures to be made in and around Chicago next year will be somewhat influenced by the rapidity achieved in consummating the consolidation of the local transportation systems.

"In the utility business it is quite some time from the date at which money is spent for new plant or additions to existing plant before such expenditures are reflected in earnings. In some instances it takes but a few months before these investments contribute to the earning capacity of the properties; in others all of two years pass before returns are shown. I question whether, upon an average, investment budget expenditures of any year are effective in contributing to earnings in less than a year to a year and a quarter.

"The figures I have given as to our investment expenditures for this year and our estimates for next year are a reasonable indication of the faith we operating people have in the future of the country and the utility business. Considering the time it takes to complete additions and extensions and the time which must elapse before the money required therefor can be effectively reflected in earnings, we naturally must look some distance ahead. In looking ahead we view the present business depression as only temporary. We feel that this depression will have relatively little effect upon the growth of our business over a period of years.

Capital secured readily

"Notwithstanding the fact that business is depressed, it has been easy enough to raise money for capital expenditures this year, and we believe it will be the same for the expenditures we expect to make next year. We have had no trouble in selling, for investment, either stocks or bonds. As examples, one of our companies has doubled its number of stockholders in less than a year and another shows upward of 25 per cent increase in the number of its stockholders. Therefore we feel that the public shares our faith in the future of our business.

"Now as to earnings. As operators, our aim is to get increased output and increased gross earnings from year to year. But about the middle of last year we began to get warnings—from our month-to-month reports on output and operating revenue—that there might be a falling off in the percentage of increase we had hoped for. These warnings came from both electric and gas utilities and were especially significant from our transportation properties. This percentage of increase started to go down in the summer of 1929, and there was an

accentuated decrease in the percentage of increase toward the end of the year.

"When the panic of last November occurred, I wondered whether it would be followed by a decided depression in our business. I felt that I had had no experience that would enable me to forecast the effect that a panic in the stock market and a general depression in business would have upon the revenue of public utilities.

Utilities little affected by depressions

"The use of electricity in the homes and in the arts had advanced so rapidly and had become so general in the years following the end of the Great War that I could not make up my mind as to whether it had, locally, reached the saturation point or not.

"Month-to-month experience of this year, 1930, has brought me to the conclusion that although the use of manufactured gas has more or less reached the saturation point, except in house heating and the arts, the decrease in revenue from the sale of gas in times of depression is relatively slight.

"The situation in regard to the use of electricity is even more favorable. We still get a steady increase of use for household purposes, and this increase has been about enough to compensate for decreased use in the arts which has been brought about by the depression.

"For a number of years the operating expenditures of all public utilities have been quite high. It is not possible to hold down operating costs during a period when every one is spending money lavishly. When a depression comes, however, a time when every one thinks he is poor and is trying to save money, it is natural for an operating manager to endeavor to cut his expenses. While we all try to keep all our people employed, the disposition to curtail what might be called the frills of business, and to see to it that we get a full day's work for a full day's pay, is inevitable. But the really efficient among our employees need have little or no concern about the continuity of their employment because of this tightening-up policy.

"Speaking from my own experience in the operation of the properties of the so-called Insull group, I have the greatest confidence that the conservatively financed utilities the country over will weather the present business depression with great credit to themselves and satisfaction to their owners. Also, that they will continue to make large expenditures for additional plant and equipment, despite the depression. Thus they will be ready to reap the advantage of the upturn which will come to the utilities as soon as general business shows even a relatively slight improvement."

▼ ▼ ▼

Profits in Merchandising Losses

THAT the apparent losses in some utility merchandising operations are, when traced down to the consumer's bill, insignificant in amount; that rate reductions consequent upon increased consumptions following aggressive merchandising much more than compensate for such minute additions to the consumer's bill, and that the cost of promotional work and advertising, which is necessary if merchandising is not included in utility operation, would practically equal such losses—these were the contentions of W. H. Hodge, vice-president Byllesby Engineering & Management Corporation, in a paper on "Selling," presented at the recent convention of the Great Lakes Division, N.E.L.A. Mr. Hodge instanced a particular case:

"For studying the facts in a definite way a fair-sized electric light and power company, serving at the close of last year about 98,000 residential customers, was selected. This company is located in the Southwest and its extensive transmission lines supply something like 200 communities. A large area with a rather thin density of population is covered. The expense of appliance selling is above normal for these reasons. For example, in merchandising operations it is necessary to maintain 32 stores to reach the people, or an average of one store for about 3,000 customers. In many of the communities no one would be effectively selling appliances if the company withdrew.

"This particular company absorbs appliance promotional expenses in its merchandise account. It charges to this account pro rata purchase and warehouse expense, rent, insurance, accounting, general overhead—in fact, any conceivable expense that can be imagined. Electric ranges are sold under severely competitive fuel conditions. An apparent deficit in appliance selling is to be expected, and in the year 1929, with a gross appliance business of more than $750,000, an apparent deficit occurred to the extent of $56,744.

"On the surface, here appears to be a good case for the critics, but what are the facts upon investigation? In the first place the quantity of kilowatt-hours delivered for residential purposes is segregated and found to be 39,150,310. You divide this quantity of kilowatt-hours into the apparent merchandising loss of $56,744, and the quotient is the amount per kilowatt-hour. The loss per kilowatt-hour is found to be a little less than 1½ mills, or 14½ per cent of one per cent. The amount is so negligible that it could not be incorporated in a residential rate schedule. It means an apparent difference of less than 5 cents a month in average bills.

Average customer saves $5.24

"But the foregoing is only a part, and a very imperfect part, of the whole story. The real story shows how the customers saved many times 1½ mills per kilowatt-hour, largely because apparent merchandising losses were incurred. In fact, further analysis leads to the conclusion that the merchandising policy of the company was primarily responsible for rate reductions amounting to nearly ten times 1½ mills, or 1.46 cents per kilowatt-hour in the average rate collected from domestic customers.

"Each customer, on the average, had a saving of $5.24 in his bill for the year 1929, after deducting the apparent negligible merchandising loss, compared with what he would have paid under the 1925 rates.

"The company under discussion had refrained from

the selling of appliances and 'Mazda' lamps up to the year 1925. In that year, owing to the disappointing development of residential business, a policy of merchandising electrical appliances on a competitively fair basis was inaugurated, and it has since been followed.

"In 1925 the average consumption of electricity per domestic meter, using the number of customers at the end of the year, was 312 kw.-hr. Four years later, with a merchandising policy in effect in the meantime, this figure had been increased to 399 kw.-hr. per residential customer, a gain of more than 28 per cent.

"During a period of four years and seven months $2,592,894 worth of appliances were sold by the company, the average use of electricity in the home increased 28 per cent and the resultant increased volume of business had enabled a reduction of 15½ per cent in the average residential rate.

"During this same period it is estimated that all other dealers and merchants in the territory sold approximately $10,000,000 worth of electrical appliances, exclusive of radio sets, which were not sold by the company. This would mean a combined total of $12,592,894, of which the company's share was 21 per cent; all others 79 per cent. It is believed that the dealers and merchants greatly increased their volume over what it would have been if the company had not participated. The company did not cut appliance prices, did not offer unusual deferred payment terms, and in general conducted its business along approved ethical lines.

"All the evidence in this example leads to the conclusion that every one concerned benefited from the company's merchandising activities; the public first, in added electrical conveniences and reduced rates; the company, in improved load factor and larger volume of business; the dealers, by increased sales resulting from the stimulation of company effort and the pioneering and promotional sales and advertising work of the latter.

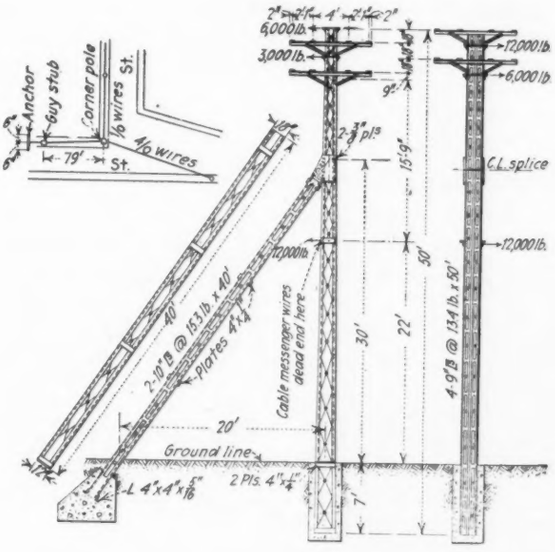
"The final conclusions are these: Electrical appliance selling must be carried on by central stations in small places and rural districts if it is to be done at all effectively. Rural development is impossible without such method. The greatest efficiency and economy is obtained by selling a full line of appliances in the entire territory served by a company. Companies serving large communities which do not merchandise have to spend money in promotional and stimulative effort, and such expenses must be contrasted with apparent losses in appliance selling. In either case the amounts are negligible on a kilowatt-hour basis. In both cases the expenditure leads to larger volume of output, increased electrical benefits to customers, greater use of central-station investment and lower rates."

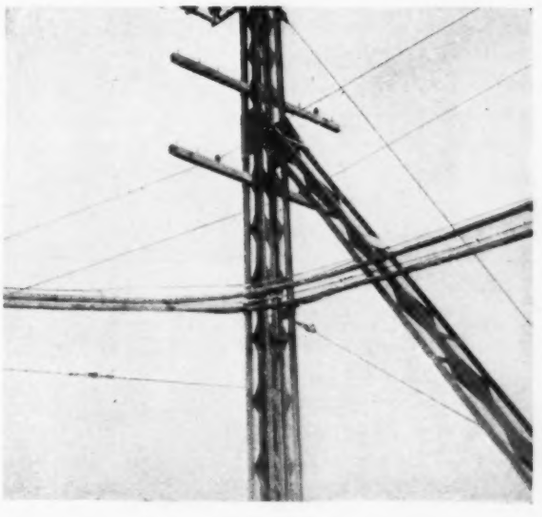
▼ ▼ ▼

Difficult Angle Turn Made with Braced Tower

THE line of the Blackstone Valley Gas & Electric Company serving the 12,000-kva. industrial substation of the J. & P. Coats Company at Pawtucket, R. I., included an overhead run with a difficult point for supporting a corner post. The feeder is run underground through the densely populated part of the city, then overhead to the mill, a total distance of about two miles. The feeders are two three-conductor, 300,000-circ. mil., the underground cables being made up with paper insulation and lead-sheathed, and the overhead cables are cambric-insulated and protected with steel tape.

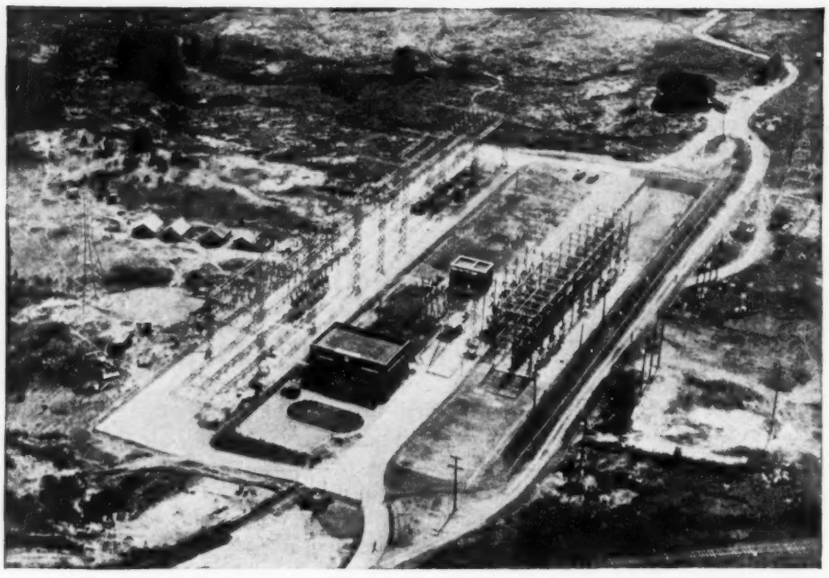
The problem of supporting a post at the overhead-line turning point, about a quarter of a mile from the mill substation, was aggravated by the existence of buildings which prohibited the use of ordinary guys. The solution of this difficulty resulted in a safe structure, built of laced members. The appearance of the supports is not objectionable since the steel members and guy wires match well with surrounding structures.





Steel tower supporting cable and open wire for industrial feed braced and guyed for angle turn on street corner

A Departure in Substation



By

W. B. MORTON

BASIL PAYNE

Allied Engineers, Inc.
Birmingham, Ala.

Northwest primary substation, Atlanta, as it appears from the air

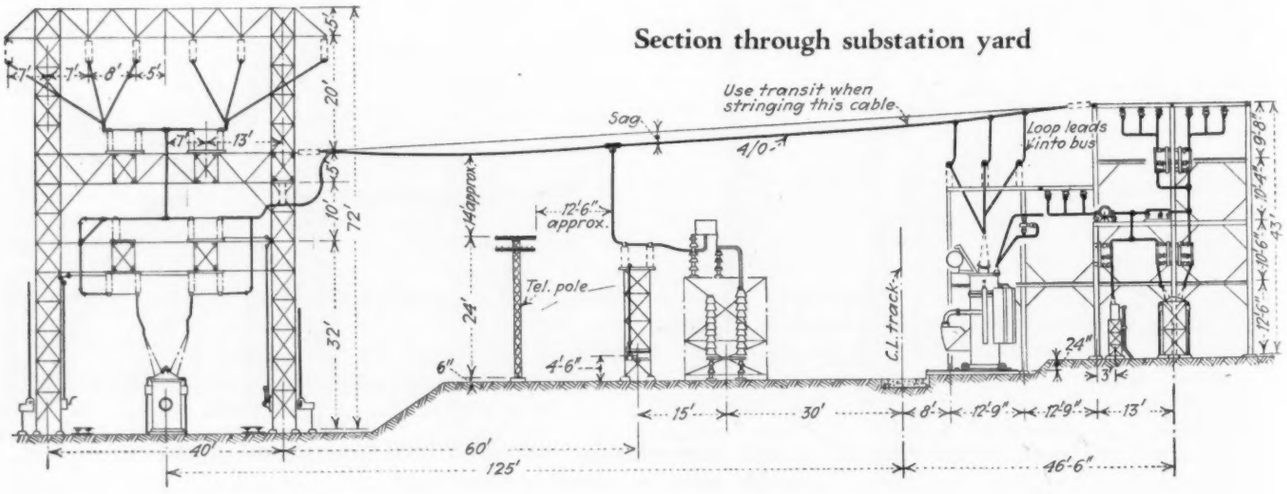
IN THE Northwest primary substation of the Georgia Power Company a rather complete departure is made from the standard type of substation in design and layout.

This station, which is just outside the city limits of Atlanta, serves a threefold purpose: It is an important switching point in the nearly completed 110-kv. loop about Atlanta; it supplies power to the most important load of Atlanta in the downtown area, ultimately tying into the alternating-current network, and it serves as the point of contact between the new Plant Atkinson steam generating station and the 110-kv. system.

The initial 110-kv. installation comprises oil circuit breakers and complete switching facilities for three double-circuit 110-kv. lines, a bus tie and one 36,000-kva. transformer bank. The 19-kv. equipment consists of one low-side bank breaker, a bus tie and seven feeders.

Extensions that may be necessitated in the future may be conveniently made, the design and layout of the station providing for that. The layout of the 110-kv. structure is such that a future bus-tie breaker, an additional transformer bank, bus-sectionalizing switch and possibly bus reactors may be added with little or no addition of steel. By a slight rearrangement of lines a future second double-circuit line to the steam plant may be added. A second 36,000-kva., 110/119-kv. step-down bank may be added to the 19-kv. equipment, making for a total capacity of 72,000 kva. There is also space for a

Section through substation yard

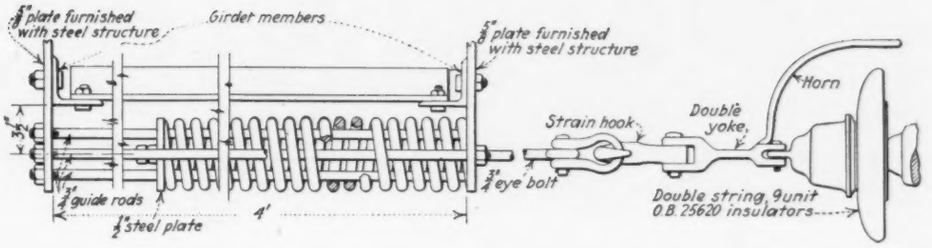


Design

Box girders for 110-kv. substation
Springs used on 110-kv. bus supports
Rolled sections for 19-kv. substation
Lighting, oil handling, switching

Spring retrieves sag in main bus

This spring maintains uniform sag throughout all ranges of temperature. It is constructed of ⅜-in. round stock and has a free length of 47 in. and a length of 34⅞ in. when loaded to 1,700 lb. It is cadmium-coated to prevent corrosion.



bank to serve a possible synchronous condenser. Bus-sectionalizing switches, bus reactors, a second bus tie and nine additional feeders are also provided for.

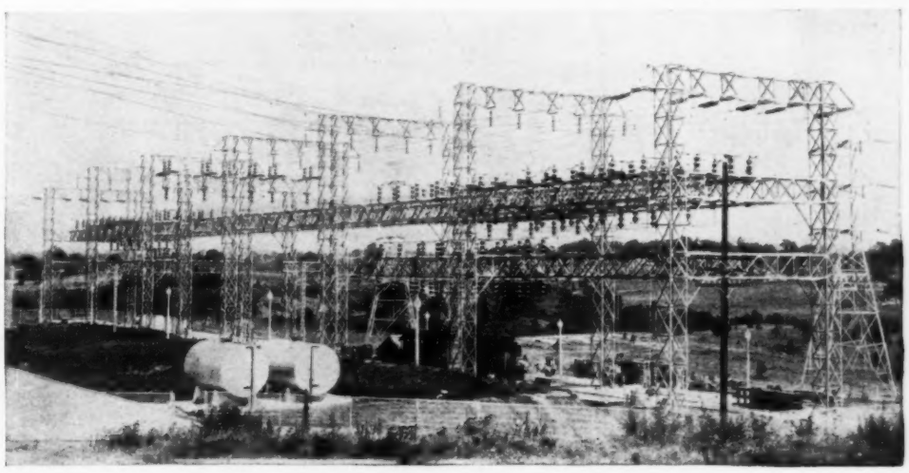
In the construction of the 110-kv. station box-type girders were used. The bus selector switches are mounted on the two upper girders, the lower girder carrying the breaker cut-out switches. The lines pull off from the outside girder opposite the bus selectors. The bus proper, 62 ft. above the foundation line, is suspended from each intermediate bent and strained off from each bent. By this arrangement ample space is provided around each breaker for installation, inspection and repairs. All buses and disconnecting switches are spaced on 10-ft. centers.

Final design of the structure provides for live loads as follows: At each conductor support 2,000 lb. horizontal and 500 lb. vertical; at each switch support 1,000 lb. per complete single-phase switch pole. The towers are 4 ft. square, and the girders are 4 ft. wide by 5 ft. deep. Each type of girder is designed to meet its own set of conditions. The heaviest girder, that for the line pull-off, weighs 6,300 lb., or 90 lb. per foot; the lightest, for the bus suspension only, weighs 1,850 lb., or 28 lb. per foot. The heaviest members used, 5-in. x 5-in. x ⅜-in. angles, occur in the girder just mentioned and also in the short cross-girders. The lightest section used for bracing is a $2\frac{1}{2}$x$2\frac{1}{2}$x$\frac{3}{16}$-in. angle. Tower legs are 3x3x¼-in. angles. Examination of the completed structure indicates that the design was conservative. The deflection in the end towers is about 2 in. and in the most heavily loaded girder about 1½ in. The foundations were designed as simple footings. The complete structure contains 134 tons of steel and covers a space 430x40 ft.

The eight 110-kv. oil circuit breakers were all furnished by the General Electric Company. Plant Atkinson transformer and bus-tie breakers are type FHKO-139-60C-F2, 600 amp.; the other four lines have type FHKO-239-60C-F2, 600-amp. breakers. All are equipped with six bushing-type current transformers and condenser bushings. Potential network devices are used for synchronizing and pilot lights, there being no 110-kv. potential transformers installed.

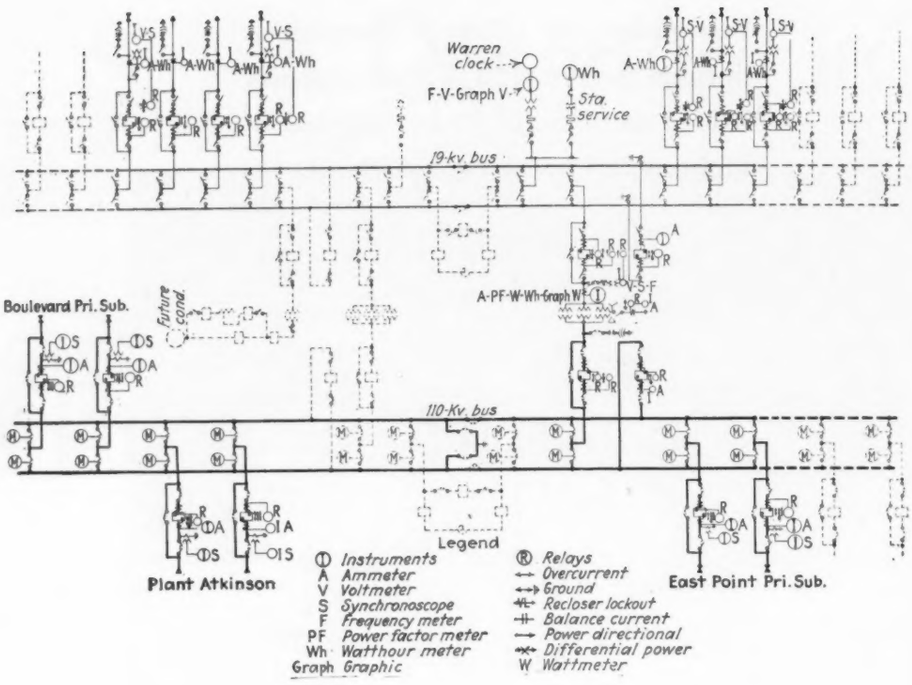
All disconnecting switches are 110-kv., 600-amp., of the double-rotating-stack, side-break type, and all are gang-operated. The terminals of these switches are arranged to point in the direction in which the conductor leaves, thereby presenting a neater appearance than if all terminals were of the usual horizontal type. A bus-sectionalizing switch is installed in each bus, but these switches are at present used for bus grounding and will be until the second line is brought in from Plant Atkinson. At this time other bus-grounding switches will be added.

The main bus is of 750,000-circ.mil bare stranded hard-drawn copper, the taps from bus to selector switches are of 350,000 circ.mil, and the connections below the bus selectors are 1-in. I.P.S. copper tubing. Except for



Box girders used in 110-kv. structure at Northwest

The oil-storage tanks in the foreground are well clear of all live equipment.



Layout of structures and equipment

bus may be "grounded out" through a permanent grounding switch, or the buses may be tied together by means of the bus-tie oil circuit breaker. All disconnecting switches are manually gang-operated except the bus selector switches, which are motor-operated by remote control from the switchboard. The cut-out switches which isolate the oil circuit breakers consist of a three-pole, single-throw "disconnect" on each side of the breaker. A recent development in switching has been the connection of these two switches to a common operating handle, making, in effect, a single-throw, six-pole switch for this location.

The 19-kv. bus structure, which includes the transformer bank and its buses, is built up of rolled-section channel or angle members, having more numerous but lighter load supports and smaller electrical clearances than the 110-kv. structure. The decision to use the rolled-section type of structure at the Northwest station was made because there are fewer separate pieces to be handled previous to and during erection and the mounting of equipment is decidedly easier.

As finally adopted, this structure consists of three rows of 8-in. and 32.6-lb. "H" columns spaced 13 ft. apart, tied by struts and diagonal braces into 20-ft. bays. The structure is 43 ft. high above the foundations, which are designed as simple footings.

The transformer bank and bus-tie breakers have a 2,000-amp. rating and are motor-operated, while the seven feeder breakers have a 600-amp. rating and are solenoid-operated. The 19-kv. oil circuit breakers are all General Electric type FHKO-130-30-C-S, rated at 25 kv.

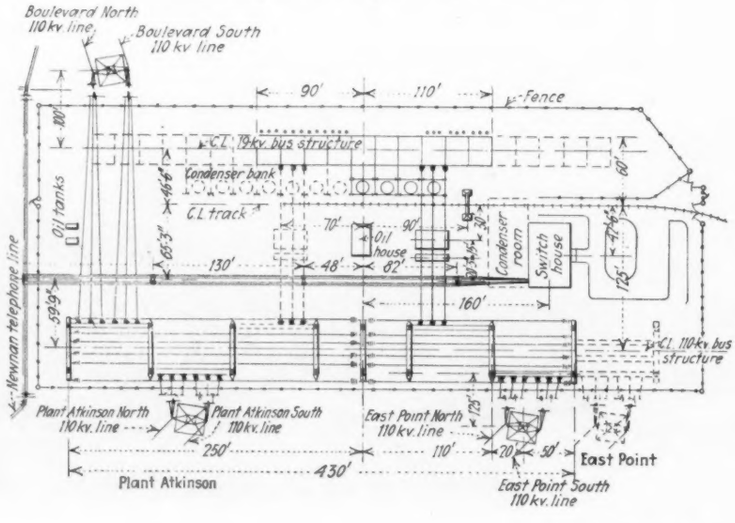
All gang-operated disconnecting switches in the 19-kv. bus structure are of the three-insulator type, the center insulator moving out and opening the single-hinged blade. Hook-stick disconnecting

the switch terminals, which were furnished with the switches, all bus connectors, insulator bus supports and terminals were manufactured by Burndy and are full-clamp type with no soldered joints. All post insulators used on switches and bus supports are made up of three Locke No. 7785 units. All insulator strings are composed of O.B. 26520 units, eight units in suspension, nine units in strain. Single strings, each with arcing horns, are used throughout except for the main bus, on which double-yoke assemblies are used.

In order to keep the bus sag and tension as uniform as possible, heavy compression springs are used at each end of the 110-kv. bus. Since the main bus is rigidly supported at the center, each set of springs is required to take up one-half of the total expansion. These springs have an unloaded length of 47 in. and a length of 34¾ in. under load of 1,700 lb. An oxide-film lightning arrester is installed between the 110-kv. bus structure and the transformer bank for protection, a gang-operated switch serving to disconnect it from the line.

The system of switching adopted for the Northwest 110-kv. structure consists of full double bus with bus selector switch and an oil circuit breaker, each with cut-out and bypass switches for each line. Either

General ground layout of substation



Attractiveness combined with efficiency in substation design

Switch house has attractive emblem plaque over the front door.

switches are mounted above the lightning arresters for isolating them from the line. The bank and bus-tie switches are rated at 2,000 amp., those for the feeders at 600 amp., all 25 kv.

The main bus is of 2½-in. I.P.S. copper tubing, anchored at certain insulators, with slip joints on all others and expansion joints to care for all movement. The bank and bus-tie breaker leads are of 2-in. I.P.S. tubing, those for the feeders being ¾-in. I.P.S. Expansion joints are provided on all breaker terminals. As in the 110-kv. yard, all connections are clamp-type, without solder, the majority of them being Burndy. The principal exceptions are those terminals furnished with the switches and the expansion joints at the 2,000-amp. breaker terminals, which were designed locally.

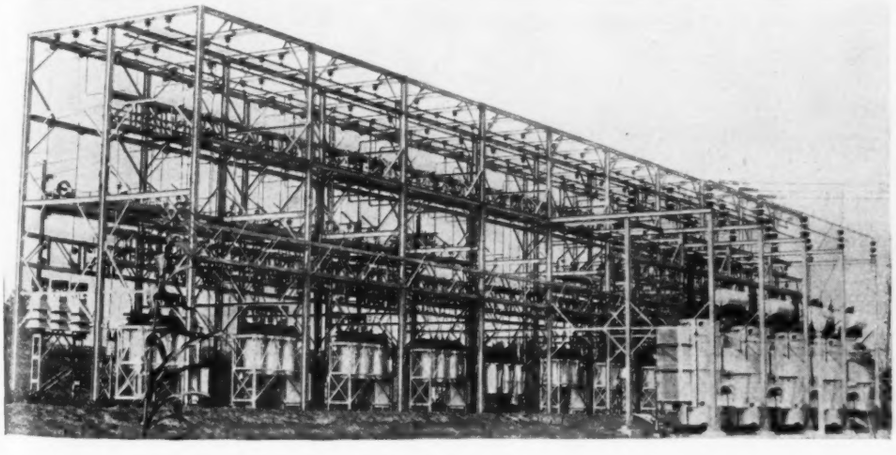
The insulators used on all switches and as bus supports are post-type, Locke 1000-G2. The line pull-off insulator strings are three units of O.B. 26520 without arcing horns. The use of a minimum number of insulator types in a station materially reduces the number of spares required and also tends toward a more uniform appearance.

Niagara type current transformers are provided for metering on all feeders, together with a potential transformer on each line which ties into a separate source of supply. These potential transformers furnish energy for pilot lights, for synchronizing, and for locking out the reclosers to prevent their closing the breaker in on a hot line. Another potential transformer is provided on the transformer side of the bank breaker for synchronizing. Station service power is supplied from a bank of three 50-kva., 19,250/110/220-volt transformers, which are connected to the bus through a switch, fuse and resistor combination. Two 500-va. bus potential transformers connected to the bus in a similar manner furnish bus potential for the switchboard.

The power transformer bank is in an extension of the 19-kv. structure, immediately beneath the 110-kv. and 19-kv. buses to which the terminals are connected by jumpers. The four General Electric single-phase transformers are rated at 8,000 kva., 110/11.55-20 kv., O.I.S.C., and are provided with blowers with which the rating may be increased to 12,000 kva. One unit is a spare. Both high- and low-voltage buses are so arranged that this spare may be cut into service by making suitable jumper connections, no moving of transformers being necessary.

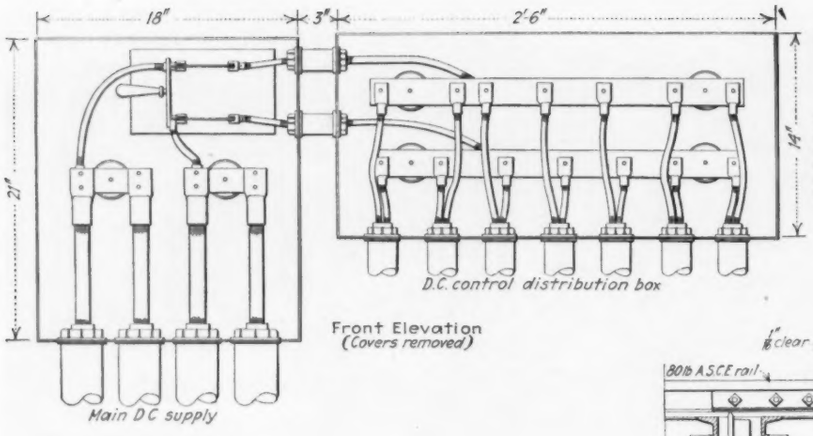
The transformers are mounted on trucks which rest on rails secured to the concrete foundations by means of standard rail clips. These foundations are carried out beneath the transfer track, thereby keeping both the rails of the transfer track and the foundation rails in alignment. In this way the rails of the transfer truck upon which the transformers are moved under the hoist tower always line up with the rails on the foundations, and the job of moving a transformer is made safe and rapid, no blocking or wedging being necessary.

The switching scheme adopted for the 19-kv. system



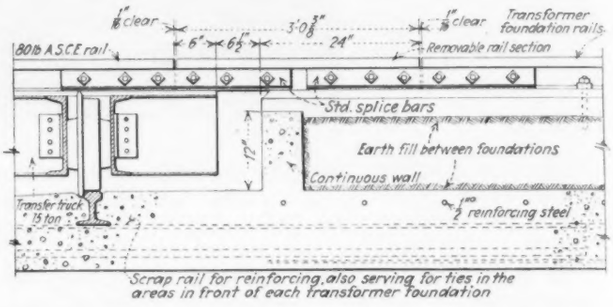
19-kv. structure at Northwest built with rolled-section members

The transformer-bank structure is shown at the right of the 19-kv. structure.



Connection between main supply and distribution box eliminates danger

Operator may test or repair any circuit terminating in the d.c. distribution box without danger of coming in contact with live parts by opening switch on the lines. Six assemblies, as shown, were used on the original installation with provision for two additional assemblies in the future.



Removable rail section facilitates handling of large transformers

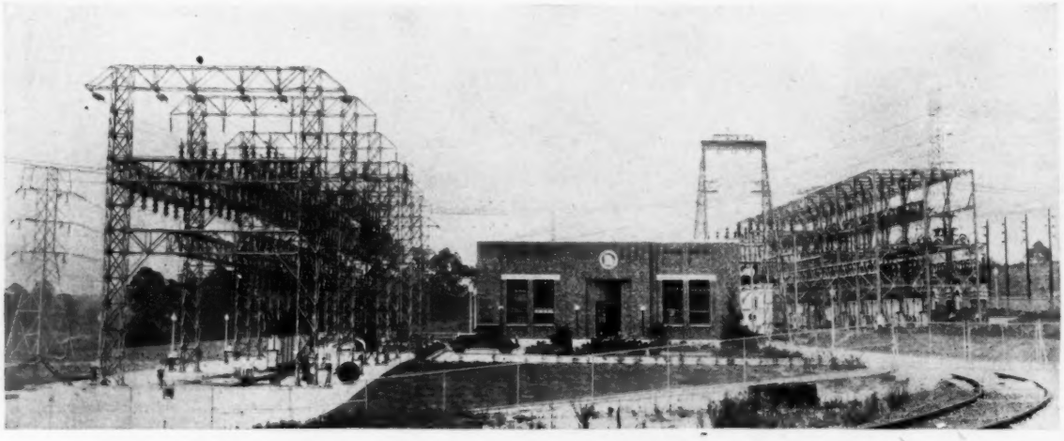
The diagram shows the connection between the transfer truck and transformer foundation. The space between the truck and foundation is bridged by a removable rail section made long enough to accommodate a standard rail splice bar at each end. No blocking is required as the splice bars develop ample strength.

closely resembles that used in the 110-kv. yard. However, in the 19-kv. structure each breaker occupies a separate bay and each feeder has current and potential transformers and a lightning arrester. Moreover, hook-stick-operated switches are used on the lightning arrester cut-outs instead of gang-operated switches. This structure also provides for a three-phase station service bank and two bus potential transformers, all of which may be supplied from either bus through selector switches. The potential transformers are connected directly to the line.

The switch house is of brick construction with a floor area 52 ft. 5 in. x 32 ft. 9 in. The control room occupies the entire main floor. The building is 20 ft. high above the concrete foundation, giving a control-room ceiling height of 13 ft., 4 ft. for the roof trusses, which are carried on "H" columns, and about 3 ft. for the parapet wall. A rough-cut brick is used, having several shades of chocolate brown, which makes a pleasing contrast with the light-gray marble trim. A novel feature is the use of a terra-cotta copy in natural colors of the Georgia Power Company emblem immediately over the front entrance.

The interior of the control room is plastered, the ceiling on metal lath and the walls over a 2-in. layer of rock-wool insulation. Rock-wool insulation is also applied over the ceiling. The floor is covered with linoleum laid in contrasting squares, with a border and cove base to match. Steel sash is used throughout, and all exterior doors and trim are covered with kalamein copper. Long-span gypsum hollow roof tile is used for the roof decking, which is covered with Barrett four-ply specification roofing.

The switchboard is divided into three sections—110-kv., 19-kv. and station service. The first two boards are arranged with the control panels facing the operator's desk. The relay panels are placed back to back against the control panels with a 7-ft. aisle between. The wiring for each panel is carried to a sub-panel, at which point the lead-covered cables from the yard terminate. The

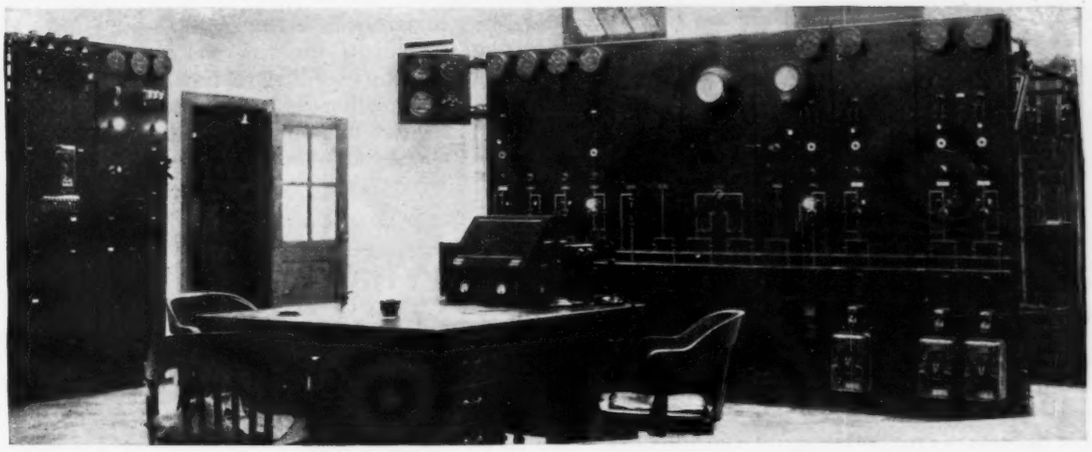


Primary substation with 110-kv. and 19-kv. structures

Front view of Northwest, showing arrangement of structures.

Glare and shadows eliminated by indirect lighting

These control boards are virtually as efficiently lighted by night as by day.



station service and battery boards are single panels so located as to line up with a future condenser control board. The cables for control, indicating and metering circuits are 600-volt rubber-insulated, lead-covered cables and are run in a galvanized conduit.

Energy for operating breakers is supplied from a 60-cell battery mounted in a rack in the battery room in the basement. A 5-kw. Rochester diverter-pole motor-generator set is kept floating across the battery. The battery supply system is entirely separate and independent from the control cables and pull boxes. The main leads from the battery panel are 500,000-circ.mil, R.I.L.C., and extend to battery distribution boxes in the yard.

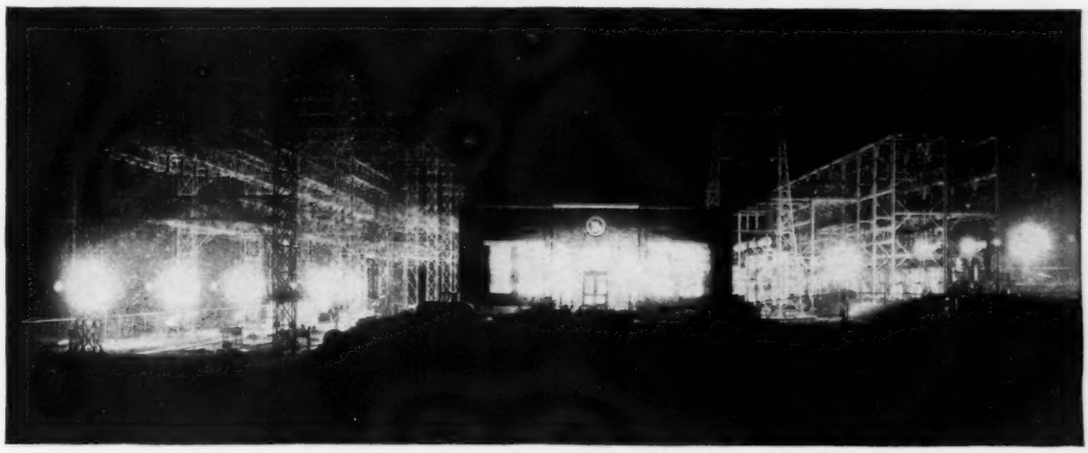
Off-peak electric heating is used at Northwest. The system consists of a 1,000-gal. hot-water storage tank, equipped with five 10-kw. electric heating units, and a combination thermostat and clock so arranged that power is used only during certain predetermined hours. Insulation on the tank and pipes prevents radiation. The house is also heat-insulated.

Indirect lighting designed to eliminate glare from the switchboard instruments is used in the control room. Curtis reflectors mounted at the top of and behind the switchboard project the light upward to the ceiling and wall surface, which has a light eggshell finish for diffusing the rays. Thirty-two 150-watt units are used, giving an illumination of approximately 10 to 12 foot-candles on a plane 3 ft. above the floor.

Lighting units mounted on standards are used to illuminate the outdoor bus structure. The standards are of concrete, 13 ft. high, with a single "Novalux" rippled-glass globe and canopy. Within the unit are mounted two lamps, one 750-watt or 1,000-watt main lamp with a reflector and an auxiliary 200-watt lamp. A row of these units is installed on each side of the 110-kv. and 19-kv. structures, twelve being used for the 110-kv. yard and seven for the 19-kv. yard and transformer bank. Convenience outlets are installed in the bases of the standards for use with portable lamps or tools.

Six "high-line" circuits, four local lines for yard telephones, one operator's line and one ringing line, each terminating on a relay switching panel controlled by a key cabinet on the operator's deck, compose the telephone-line system. The six "high lines" are each protected by 17-kw. horn-gap lightning arresters, 7½-kva. drainage coils, specially wound General Electric protective relays, General Electric fused switch and lightning arresters and Westinghouse repeating coil with vacuum-gap arresters on the secondary side. All of this protective equipment is mounted on ebony asbestos panels.

The oil house, a building somewhat resembling the



Pedestal lighting fixtures illuminate large substation yard

The efficiency of this lighting system is indicated by the clean definition of details and absence of glare

switch house in appearance and construction, 14 ft. x 25 ft. in plan and containing two rooms, was constructed to house the oil-purifying equipment and the spare parts.

Facilities have been provided which insure handling of the large amount of oil required with ease and speed. In this oil system all power transformers and floor-mounted oil circuit breakers are permanently connected to the system through 2-in. lines to mains of the same size. The frame-mounted oil breakers and smaller transformers are connected to the system by means of flexible metallic hose for which connections are provided at convenient points. Headers are run to the various groups of equipment, and these headers converge to a valve assembly or manifold in the oil house. Two 5,000-gal. oil storage tanks, together with a tank-car spur track, make it possible to ship oil into the station in tank cars at a decided saving in labor, oil and time.

Among the non-electrical items which contribute to operating efficiency at Northwest are good roads, walks and drainage. Concrete walks, with steps where necessary, are extended to all points at which there are operating handles. A complete system of gutters, catch basins and subsoil drains has been installed.

Every possible precaution has been taken to insure the safety of the operators. Each bus, each phase on each breaker and each disconnecting-switch mechanism is marked with its number. The operating handles are locked in position and each operating rod is positively grounded. An insulating platform is also placed conveniently near the switch handle. An extensive ground system of the ring-bus type is installed, to which all equipment and structures are solidly connected. Each arrester has its own ground group, which together with the five main-ground fields gives a station ground resistance of 1.5 ohms.

▼ ▼ ▼

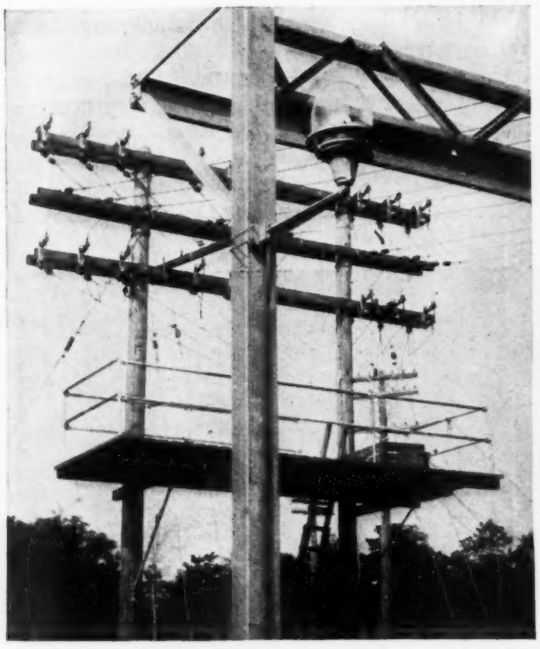
What Customers Think of One Utility Company

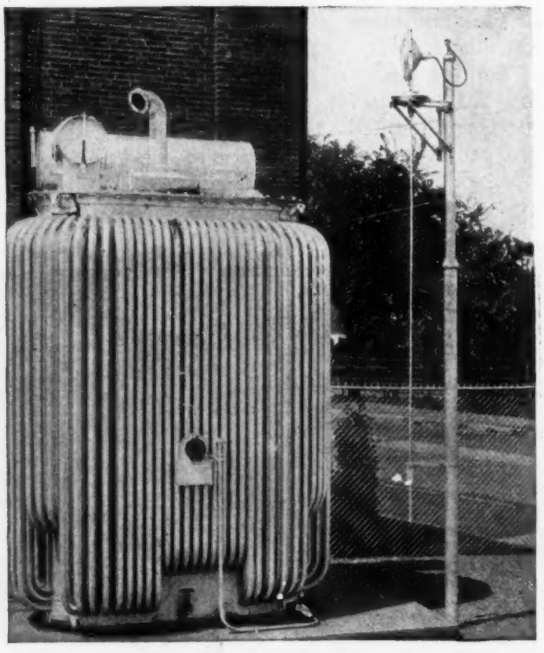
RELATIVELY few surveys have been prepared to indicate the attitude of the consumers in a given territory toward the utility which serves them. In an endeavor to secure more specific and factual information one organization recently secured the services of an agency fitted for such an investigation and inquiries were directed through personal calls by mature and capable men to 2,700 consumers selected at random in a certain territory.* Primarily the objective was to determine the appliances used and the extent of their use, but six other questions bearing upon customer relations and policies were injected into the inves-

**As reported in an address by Alex F. Osborn, vice-president Batten, Barton, Durstine & Osborn, Inc., at the recent meeting of the Empire State Gas and Electric Association.*

▼ ▼ ▼

Lighting Outdoor Substation





Flexible adjustment of lighting units in outdoor substation yards is coming more and more into favor, owing to the simplicity and mechanical strength of clamps suited to tubular and I-beam supporting structures. The 200-watt fixed-bracket lamp at the left was mounted in this way without drilling into the column despite its rigid-conduit feed line. The floodlighting unit at the right—a Boston Edison installation—can be adjusted for different heights throughout a wide range if necessary by means of its bracket clamps and can be readily turned from the ground by the operating rod shown.

tigation and put to the consumers by the investigators.

Is your utility company arbitrary or indifferent?
Yes, 6 per cent — No, 94 per cent

Do you get prompt and courteous service?
Yes, 99.4 per cent — No, 0.6 per cent

Cost of electrical energy compared with other commodities regarded as relatively cheap?
Yes, 93.7 per cent — No, 6.3 per cent

Do you consider your electric bills reasonable?
Yes, 81 per cent — No, 19 per cent

Who should own the utility business?
Government, 12 per cent — Private, 75 per cent

Balance consisting of those who either have no opinion or refused to express an opinion on the subject.

Apparently greatest satisfaction is with the prompt and courteous service rendered by the utility company, while the matter of ownership involves greatest diversity of opinion.

▼ ▼ ▼

READERS' FORUM

Germany's Co-operative Plan of Merchandising

To the Editor of the ELECTRICAL WORLD:

We have read with great interest your article, "Germany on the Up-Gra le," in the ELECTRICAL WORLD of July 26, 1930, and are pleased to find conditions in Germany, with certain exceptions, properly described. However, in the last part of your article, concerning the propaganda and sales methods of the German utility companies, German conditions seem to be seen somewhat too black.

We suppose you know that in the big German cities, especially in Berlin, electricity is supplied by the communities. The municipal electricity companies are forced to respect the interests of the dealers and electrical contractors living in the cities and are, therefore, very much hampered in their selling activities for electrical appliances.

In order to compromise with these necessities, our company has promoted the "Elektrissima" installment organization. Approximately 2,500 electrical dealers and contractors, living in Berlin, especially the big Berlin department stores, are members of this organization. These firms are given the opportunity to grant credit to their customers for electrical house installations, lighting fixtures, electrical appliances and motors up to one year without investing their own capital. Our company pays the amounts equivalent to the given credits to the firms which are members of the Elektrissima organization and collects the amount in monthly installments from the customers at the same time as bills for energy.

In establishing this department in October, 1926, our company created a selling organization which induces the customers to increase their energy consumption without bringing the municipal electricity company in selling competition with electrical dealers and contractors.

The following figures indicate the development of the Elektrissima department:

	No. Applications	Amount Involved	No. Applications on Credit
1927	112,000	$2,125,000	52,000
1928	170,000	3,250,000	80,000
1929	172,000	3,325,000	80,000

We should like to call your attention to the fact that owing to the war and the inflation in 1925 only 28 per cent of the Berlin households were electrified. At the end of 1929 65 per cent of all households were estimated to be electrified.

The results which were obtained in Berlin with the Elektrissima system awakened the attention of other German cities, which introduced this system for their territories. Numerous foreign electricity companies have also asked, either by letter or personally, for information concerning this organization. One of the most important American electricity companies wrote us in October, 1927, that installment systems had been used in America for a long time, but expressed the opinion that the American systems were not built up as logically as the Elektrissima system.

In order to help the members of the organization in selling electrical appliances a joint propaganda organization was promoted, including the manufacturers of electrical appliances. This organization arranges propaganda campaigns with the direct purpose of selling on special occasions in the big department stores of Berlin, promotes price contests and participates in exhibitions.

We hope that you will see from the preceding that the executives of the electricity companies in Germany are men who see not only the technical and scientific side of the problems but also the urgent necessity of making electricity available to everybody in need of it.

Berlin, Germany. **Berliner Stædtische Elektrizitætswerke.**

▼

Florida Pole Lines Were Guyed; Few Poles Were Replaced

To the Editor of the ELECTRICAL WORLD:

On page 405 of the August 30 issue of the ELECTRICAL WORLD there appears an article headed "Lightning Shatters Grounded as Well as Ungrounded Poles." Reference is made in this article to an annual survey made by the Florida Power & Light Company for the last three years of pole and cross-arm shattering. It states that the "records of the Florida Power & Light Company show that 317 *grounded* poles and 109 *ungrounded* poles have been damaged somewhat," also "about one-half of these have had to be replaced."

This is in error. The facts are that "out of 14,000 poles on the Florida Power & Light Company system 317 *guyed* poles and 109 *unguyed* poles showed signs of damage, or about 3 per cent of the total number of poles. Out of this 3 per cent only 1½ per cent, or six of the total of 426 poles which have been damaged, have had to be replaced."

National Electric Light Association, Southeastern Division, Atlanta, Ga. **C. M. KILIAN,** Executive Secretary.

BOOK REVIEWS

The St. Lawrence Waterway Project

By G. W. Stephens. New York: Louis Carrier Company. 469 pages. Price, $7.50.

The St. Lawrence waterway project involves a scheme to connect the Great Lakes with the Atlantic by means of a ship canal from Lake Ontario and Montreal. It also embodies the idea of a 5,000,000-hp. hydro-electric development, of which about 2,250,000 hp. would be on the St. Lawrence along the international border and the remainder on the lower St. Lawrence within the Dominion of Canada.

This project is completely described by the author, with history, statistics and arguments for and against the project. It is an international project of great importance and has been the subject of many divergent opinions. This impartial book admirably covers the subject from the point of view of complete information and is a welcome contribution.

The treatment of the power project is largely confined to facts and to the report of the several boards and commissions, with special reference to cost, the single versus the pool development and the rate of development. About $250,000,000 is the estimated cost of the power development at Barnhart Island of 1,777,360 hp. Another $200,000,000 is the estimated cost for developing about 2,000,000 hp. on the lower river.

▼

Bühnenbeleuchtung

By Alfred von Engel. Leipzig: Hachmeister & Thal. 174 pages, 143 illustrations. Price, 8.50 reichsmarks.

While this little book may not contain much of novelty to the thoroughly trained illuminating engineer who has devoted some attention to stage lighting, it will be handy for persons working in this field who can qualify on only one or the other of these counts. Methods and equipment—the latter apparently quite similar to what we find in the United States—necessarily receive a good deal of attention, but by showing the physical basis on which stage lighting rests the presentation of the subject is made rational rather than empirical.

▼

Swiss Transmission Lines

To a scale approximating 8 miles to the inch the general secretariat of the Schweizerischer Elektrotechnische Verein and the Verband Schweizerischer Elektrizitätswerke of Zurich, Switzerland, has published an excellent map in color, showing topography, power stations and transmission lines.

Symbols indicate for each plant the annual output, maximum and minimum available power, and storage for each plant of more than 1,000 kw. Instead of voltage, the kilowatt rating of transmission lines is shown, a feature rarely indicated on transmission maps. Price, 6 francs.

Die Relaissteuerung der Modernen Starkstromtechnik

By Reinhold Rüdenberg. Berlin: Julius Springer. 79 pages, 125 illustrations. 7.50 reichsmarks.

This booklet, containing a general survey of relay control for power circuits, consists of a moderate amount of descriptive material illustrated with numerous halftones and circuit diagrams. The latter range from simple cases to the complexities of full-automatic rectifier and converter substations.

▼

Stock Market Theory and Practice

By R. W. Schabacker. New York: B. C. Forbes Publishing Company. 875 pages. Price, $7.50.

While publications dealing with various aspects of the stock market have been numerous, especially since the major market break last November, nothing quite so elaborate and inclusive has been attempted as "Stock Market Theory and Practice." In addition to covering the broad fields of speculation and investment, the writer has provided a valuable practical guide and work of reference covering the entire securities field. Brokerage-house practice, odd-lot trading, short selling, puts and calls, etc., are dealt with in an instructive yet clear and readable manner.

The section devoted to chart trading is covered by three chapters, fully illustrated with daily charts on more than 25 individual stocks, and is perhaps the book's most helpful contribution to that part of the public which seeks to systematize market operations. The author goes to great length to explain the use of charts in forecasting trends in individual stocks as well as in the general market. This section of the book, if none other, covers virgin territory in stock market education.

A valuable feature is the elaborate index which enables the reader to find any phase of particular interest readily. The book is amply illustrated.

▼

Forschung und Technik

Dr.-Ing. W. Petersen, editor. Berlin: Julius Springer. 576 pages, 597 illustrations.

Published under the auspices of the Allgemeine Elektricitäts-Gesellschaft and under the editorship of an eminent investigator, this work, according to the preface, presents results of some recent researches by the A.E.G. The book contains 40 monographs by well-known specialists, dealing with a wide variety of subjects.

A number of them are in the field of electron physics; others relate to acoustical problems such as arise in sound-film reproduction; still others deal with some of the innumerable problems in electric generation and transmission engineering. The book gives an intimation, at least, of the extraordinary quantity and breadth of research, theoretical and experimental, in pure and applied science underlying modern technical progress. The articles are in the main descriptive in style, so that the reading of them need by no means be confined to specialists in the various fields.

Men of the Industry

S. W. Stoddard Assumes New Engineering Duties

STANLEY W. STODDARD has been appointed superintendent of the northeastern division of the New England Power Association, with headquarters at Lawrence, Mass., and in this capacity will have charge of operation of the lower section of the Fifteen-Mile Falls-Tewksbury 220-kv. transmission line, the substations at Ayer and Tewksbury, the steam plants of the company's subsidiaries at Lowell and Lawrence, and

the power substations at Lawrence. Mr. Stoddard is a graduate of the University of Maine, and his early work in the electrical field was with the Harry M. Hope Engineering Company and Stone & Webster, at Boston. Ten years ago he joined the New England Power organization as electrical designer and for the past four years has been assistant to the electrical engineer, with headquarters at Boston. His assistant at Lawrence will be A. L. DEGGS.

▼

O. S. HOCKADAY has become associated with the Texas Electric Service Company at Fort Worth, Tex., in the capacity of superintendent of transmission. Immediately upon graduating from the school of electrical engineering at the University of Texas in 1915, Mr. Hockaday joined the operating organization of the Texas Power & Light Company. Aside from a year's service in the army during the World War and a year's leave for special work in the testing department of the General Electric Company in 1920, this connection has continued unbroken. Mr. Hockaday was appointed transmission superintendent for the Texas Power & Light Company in 1924, and he served in that capacity until he joined the Texas Electric Service Company. He is a member of the American Institute of Electrical Engineers and is active in National Electric Light Association work in the Southwestern Geographic Division.

•

R. B. CHILDS, commercial engineer with the Washington Water Power Company since 1923, has been named assistant general manager of that company. Mr. Childs was formerly associated with the Montana Power Company.

•

HARVEY C. COUCH, president of the Arkansas Power & Light Company, was recently made the recipient of the honorary degree of doctor of laws by the University of Arkansas. An outstanding figure in utility circles in the Southwest, Mr. Couch is widely known for his interest in the advancement of education.

•

JOHN N. CARLISLE, president of the Northern New York Utilities, Inc., was elected president of the Empire State Forest Products Association at the twenty-fifth annual meeting of the association, held at the Black River Club in Watertown October 9.

•

ALBERT J. DANAHER has been appointed secretary and general attorney of the New York Power & Light Corporation to succeed James F. McKinney, who is retiring from active business. Mr. Danaher since last October has been associated with the Niagara-Hudson Power Corporation, and since the removal to New York of Randall J. LeBoeuf, Jr., general counsel of Niagara-Hudson, has been in charge of the Albany law office of that company. In 1922 Mr. Danaher left his private practice to become an assistant attorney-general. He served in that capacity for seven years, the last two of which he was in charge of the Bureau of Water Power and Water Control. During his state service he was associated with Mr. LeBoeuf on numerous cases.

W. F. Little Heads Illuminating Engineering Society

WILLIAM F. LITTLE, who has been associated continuously with the Electrical Testing Laboratories since 1903, except for a period of four years, was last week installed in the office of president of the Illuminating Engineering Society at its convention in Richmond, Va. During the four years that he was away from the Testing Laboratories he was engaged by the Johns-Manville Corporation. His name is associated with the

development of photometry from the days when it involved visual means up to the present time when photo-cell photometry is standard practice. He is now in charge of photometry for the Testing Laboratories. He has been an author or co-author of numerous technical papers on such subjects as photometry, the transmission factor of glass, reflection factors and automobile headlighting, presented at the meetings of representative societies.

Mr. Little has been a member of many I. E. S. committees and also its vice-president and treasurer. He was one of the United States representatives on the International Commission on Illumination and is a member of the American Society for Testing Materials and the Optical Society of America and a committee chairman in the Society of Motion Picture Engineers. Mr. Little received his technical education at Rutgers College.

K. R. MacKinnon in New York

K. R. MacKinnon, formerly assistant general manager of the Nebraska Power Company, Omaha, is now connected with the Electric Bond & Share Company in New York. The Nebraska company is under the supervision of the Electric Bond & Share Company. Mr. MacKinnon had been an active figure in utility affairs in the Middle West before transferring his interests to the East. He had not completed his term as president of the Middle West Division of the National Electric Light Association, to which office he was elected last spring. He is also a past-president of the Nebraska Section of the National Electric Light Association.

▼

F. T. McEvoy, formerly connected with the Eastern New York Utilities Corporation, one of the properties of the Niagara-Hudson group, has been appointed purchasing agent of the New York Power & Light Corporation.

•

Fay Smith, assistant general manager and chief engineer of the Nebraska Power Company, will also assume the general supervision of the generating station. Mr. Smith's present duties are supervision of the engineering, construction and distribution departments. He has been with the Nebraska Power Company twelve years.

•

Stanley M. Tracy, treasurer of the Driver-Harris Company, Harrison, N. J., was tendered a dinner on October 9 by his associates in celebration of his twenty years' service with the company. He started as office manager of the American Wire Cloth Company, a subsidiary company, and was elected treasurer and director in 1922. In 1929 he also became director of the British Driver-Harris Company.

•

W. C. McWhinney has been appointed commercial manager of the Southern California Edison Company. Mr. McWhinney, assistant general commercial manager since July 1, 1926, succeeds W. L. Frost, who, as announced in the October 11 issue of the Electrical World, has been named a vice-president of the company. Mr. McWhinney has been with the company 21 years, entering the service November 1, 1909, as a stock clerk in the stores department.

•

Charles L. Eidlitz has been appointed managing director of the Credit Association of the Building Trades of New York. Starting as an electrical contractor in 1888, he organized in 1903 the Building Trades Employers' Association of New York City and became its first president. In 1892 he organized the New York Electrical Contractors' Association and nine years later the National Electrical Contractors' Association, now the Association of Electragists International, and was chosen its first president. He was an active figure in 1907 in the establishment of the manufacturers' association that later was merged in the National Electrical Manufacturers' Association. He was chairman of the board of directors of the Electrical Board of Trade of New York from 1923 to 1928. He was appointed chairman of the board of directors of the Structural Steel Board of Trade in 1925 and will so continue.

▼ ▼ ▼

OBITUARY

Thomas Sproule

Thomas Sproule, general superintendent of distribution in the electric department of the Public Service Electric & Gas Company, died from a heart attack while talking to some of his associates in his office at the company's headquarters in Newark on October 10. He was 51 years of age.

Mr. Sproule had been a national figure in the electrical industry for a

number of years, having attracted special attention by his untiring efforts in the activities of the industry's representative societies. Nearly all electrical and commercial organizations and associations have benefited from the specialized knowledge and practical engineering skill which he applied in the extensive committee work in which he engaged. His wise counsel and executive ability were recognized as invaluable in his own company and in the many industry groups with which he was connected.

Mr. Sproule was born in Philadelphia and received his education in that city. He entered the electrical industry in 1895 as an employee of the Brush Electric Company, which was later merged with the Philadelphia Electric Company. This connection was not severed until 1921, when he resigned as assistant engineer of transmission and distribution to become identified with the Public Service Electric Company of New Jersey, as it was then called, in the capacity of assistant to William K. Vanderpoel, general superintendent of distribution. When Mr. Vanderpoel resigned in 1926 to join the Okonite Company, Mr. Sproule took over the duties of general superintendent of distribution, the position he had since held.

One of Mr. Sproule's outstanding achievements was the preparation of a handbook on overhead line construction which received national recognition as an invaluable compilation for distribution engineers. He took an active part in forming the Philadelphia Electric section of the National Electric Light Association and was elected its third president. He was also a past-president of the Pennsylvania Electric Association. In the course of his engineering career he was chairman of the overhead systems and safety rules committees of the National Electric Light Association and a member of the inductive interference and underground systems committees of that body. He also served on many joint committees dealing with wire crossings, joint use of poles, safety code, etc. Mr. Sproule was a member of the American Institute of Electrical Engineers, the Illuminating Engineering Society, the American Electric Railway Association and other technical societies.

▼

Eugene Schwarberg, general director of the Compagnie Electro-Mécanique and the vice-president of the French Union des Syndicats de l'Electricité, died recently in Paris at the age of 66.

•

Nathan Fallek, electrical engineer and inventor, died September 26 on his sixty-sixth birthday after an illness of several months. An Englishman by birth, Mr. Fallek was an associate of Nikola Tesla and Thomas A. Edison when he came to the United States.

Financial and Statistical News

FIVE to ten point gains recently in high-grade utility bonds reflect the shortage reported in issues suitable for savings bank and insurance company investment. Such securities in large volume are available for issue as soon as conditions warrant.

——PUBLIC UTILITY COMMON STOCK YIELDS are still substantially lower than at the market's low point of 1929. These stocks as a group still yield less than utility bonds, but deflation in some issues has tended to equalize the yields.

▼ ▼ ▼

Boston Edison Offers $30,000,000 Issues

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON made two offerings of notes amounting to $30,000,000 on October 16. The first issue consisted of two-year 4 per cent notes, totaling $20,000,000, the price being 99.62 and accrued interest, yielding about 4.20 per cent. The second issue consisted of one-year 3¾ per cent notes priced at 99.87 and accrued interest, yielding about 3.87 per cent, a piece of financing involving a total of $10,000,000. The proceeds of the notes will be applied in payment of existing 4½ per cent coupon notes amounting to $30,000,000 which are due on November 1. Early this year the company sold $30,000,000 in notes bearing interest at 5 per cent to retire a smaller maturing issue. This is the only funded debt of the company with the exception of the issue maturing on November 1.

▼

Utility Services Merge

COMMERCE CLEARING HOUSE, INC., announces the merger of Bonbright & Company Index Digest and Public Utility Law Service with its Public Utilities and Carriers Service. The Bonbright Index Digest was originally prepared for confidential circulation by Bonbright & Company and was sponsored by the National Electric Light Association. It covered the utility statutes of the various states with a current mailing service on new statutes. The new consolidated service will now be known as the Bonbright-Commerce Clearing House Public Utilities and Carriers Service. It is planned that the new Bonbright-Commerce Clearing House Service shall consist of a complete compilation of public utility statutes, court decisions, regulations and collateral technical data dealing with the whole subject of utility management, operation and finance.

An editorial committee of nationally known public utility authorities with diversified practical experience will cooperate in the development of this extensive undertaking. This committee consists of Fred S. Burroughs, of Harris-Forbes & Company; Halford Erickson, H. M. Byllesby Company; W. C. Reyer, of Arthur Andersen & Company; H. C. Anderson, consulting engineer, Ann Arbor, Mich.; Carl D. Jackson, general counsel National Electric Light Association; Kenneth Burgess, general solicitor C., B. & Q. Railroad, and George Phelps, statistician First Wisconsin Company. D. E. Lilienthal, of the Chicago bar and lecturer on public utility law at Northwestern University, is directing editor of the service.

▼ ▼ ▼

Electric Bond & Share Adds to Holdings in Client Companies

AN INTERIM report of the Electric Bond & Share Company for the period ended June 30, 1930, shows that earnings per share of common stock on the total shares outstanding at June 30 were $2.46, as compared with earnings previously reported of $2.14 for the twelve months ended March 31, 1930, and $1.97 for the twelve months ended December 31, 1929. Based on the average number of shares outstanding during each period, earnings for the twelve months ended June 30, 1930, were $2.55, as compared with $2.31 for the twelve months ended March 31, 1930, and with $2.22 for the twelve months ended December 31, 1929. No undistributed earnings of companies in which the company has equity holdings are included in the company's income statements.

The company's June 30, 1930, balance sheet shows total current assets of $109,771,927 and total current liabilities of only $11,469,787. Surplus at June 30, 1930, was $695,413,978 and reserves were $5,030,848.

The market value at June 30, 1930, of the net assets of Electric Bond & Share Company available for the company's preferred stock was approximately $795 per share and for the common stock (after deducting $100 a share for the preferred stock) was approximately $68 per share. These figures compare with a market value of approximately $1,090 per share for the preferred stock and $81 per share for the common stock at December 31, 1929. These decreases reflect the reduction in the market value between December 31, 1929, and June 30, 1930, of the securities owned by the company.

The holdings of the company at June 30, 1930, in securities of its five client holding companies mentioned below show increases over its holdings at December 31, 1929. During this period the company acquired 24,585 additional shares of American Gas & Electric Company common stock, 23,586 shares of American Power & Light Company common stock, 22,500 shares of American & Foreign Power Company, Inc., common stock, 57,900 shares of National Power & Light Company common stock and 22,401 shares of Electric Power & Light Corporation common stock. At June 30, 1930, Electric Bond & Share Company owned 17 per cent of the common stock of American Gas & Electric Company, 30 per cent of the common stock of American Power & Light Company, 41 per cent of the common stock of National Power & Light Company and 30 per cent of the common stock of Electric Power & Light Corporation.

At June 30, 1930, Electric Bond & Share Company held securities in companies, other than its five client holding companies and its wholly owned subsidiaries, of a market value on June 30, 1930, of approximately $141,531,458.

Industrial Operations Are Picking Up

SLOWLY rising manufacturing activity is reflected in the ELECTRICAL WORLD index, based on reports of energy consumption for some 3,800 industrial establishments. September operations, weighted according to value added by manufacture, were 5 per cent higher than in August, the latter month having shown a very slight advance compared with July, which remains the lowest since the summer of 1925.

The rise was somewhat more than seasonal. Adjusted figures, taking into account the normal variations in the several industries, show 0.7 per cent excess. Compared with last year the level continues low; the September figure is down 18.5 per cent; for the first nine months the average is down 13.9.

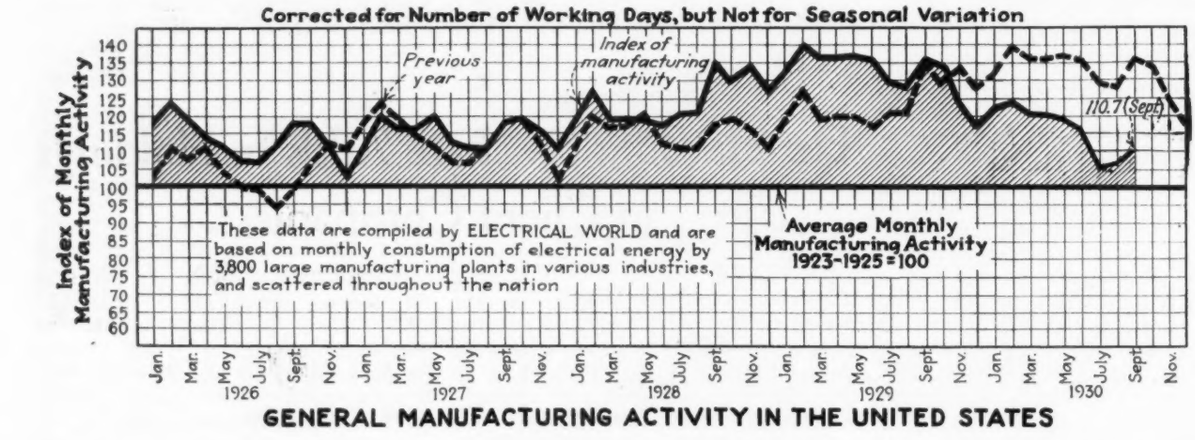
It is worth noting that the gain, though moderate, was general. Nine groups out of twelve advanced. Compared with August, the textile industry is the one that shows the greatest rate of revival. It needed it—August was its lowest month in many years. Even against July, however, the improvement is 7 per cent, but at that it was operating in September 29.5 per cent below the level for the month which was recorded in 1929.

Food products, the manufacture of automobiles and parts, metal-working plants, the paper and pulp industry, the stone, clay and glass group and lumber all gained. The rising index for chemicals and allied products was due largely to gains in oil refining and chemicals used in that connection; the wood industries gained 7.9 per cent, standing

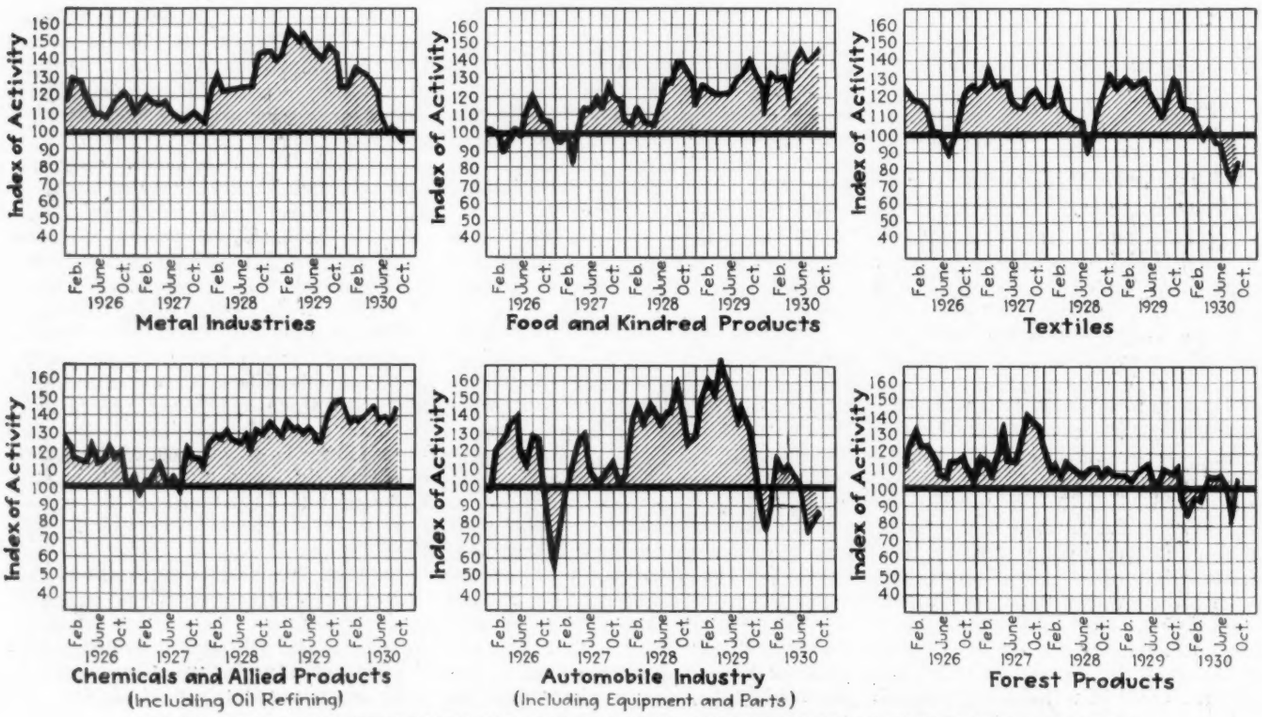
Current Manufacturing Compared with Other Periods

(Per Cent Change)

Industrial Group	Sept., 1930, and Aug., 1930	Sept., 1930, and Sept., 1929	First 9 Months 1930 and First 9 Months 1929
All industry	+ 5.0	—18.5	—13.9
Chemical products (including oil refining)	+ 8.5	+ 5.1	+ 6.4
Food products	+ 5.3	+ 5.3	+ 7.2
Steel plants	— 1.4	—27.6	—18.6
Metal working	+ 2.2	—34.0	—21.2
Leather products	—16.1	—30.3	—18.3
Forest products	+ 7.9	— 5.2	— 8.6
Paper and pulp	+ 3.5	— 6.0	— 1.0
Rubber products	— 3.0	—19.7	—12.2
Shipbuilding	+ 1.3	+ 8.1	+11.0
Stone, clay and glass	+ 1.9	—27.2	—19.6
Textiles	+12.5	—29.5	—23.8
Automobiles (including parts and accessories)	+ 2.0	—36.2	—24.5


Corrected for Number of Working Days, but Not for Seasonal Variation
Index of Monthly Manufacturing Activity
Previous year
Index of manufacturing activity
110.7 (Sept)
These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,800 large manufacturing plants in various industries, and scattered throughout the nation
Average Monthly Manufacturing Activity 1923-1925 = 100
1926
1927
1928
1929
1930

GENERAL MANUFACTURING ACTIVITY IN THE UNITED STATES



ACTIVITY IN THE PRIMARY MANUFACTURING INDUSTRIES OF THE UNITED STATES

5.2 per cent lower than at this time last year, and for the nine-month period are off 8.6 per cent.

Low spots continue in the leather and shoe industry, down 16 per cent from August after a 10 per cent drop from July, now more than 30 per cent below last year's operations at this season: also in rubber products, off 3 per cent from August but better than in June and July.

A sidelight is thrown on the employment situation by some of the individual reports. These give evidence that industries have been meeting the decreased demand for their product by reducing hours of work rather than the number of employees. The maximum loads are as large as last year, but the total energy consumption is lower than in that year.

▼

Electric Power in West Indies

DIESEL ENGINES PREDOMINATE in electric light and power service in the West Indies, it would appear from Special Circular No. 589, Revised, issued by the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, and superseding one issued on April 25, 1929. Thirty-nine localities having central light and power service are listed, in the British, French and Dutch West Indies, Virgin Islands, the Republic of Haiti and the Dominican Republic.

The largest plants are at Kingston, Jamaica, 3,700 kw. operated by steam and water power; Hamilton, Bermuda, 2,865 hp. in gas and oil engines but only 750 kw. of generator capacity, according to the report; Port of Spain, Trinidad, 1,900 kw. driven by steam and Diesel engines. A frequency of 60 cycles is more common than any other, but European influence is evident in the selection of 50 cycles for a number of good-sized plants, while the Kingston plant operates at 40 cycles.

Distribution voltages vary, but with a strong trend toward the 110/220-volt, three-wire system.

Plans Rights Issue

PLANS FOR THE ISSUE of additional capital stock to the extent of 10 per cent of present outstanding stock, through the issue of rights, are announced by the Commonwealth Edison Company. Application will be made for permission to issue the stock, which will be offered at par of $100.

This proportion of existing capital stock will call for $14,250,000 of stock. At this rate the total value of the rights will be in the neighborhood of $22,000,000. Proposed exchange is on the basis of one for each ten held.

▼ ▼ ▼

Customer Ownership Sales Shrink

DECLINING sharply from the high levels attained in other recent years, customer ownership sales of stock during 1929 decreased to 1,447,853 shares as against 2,081,070 in 1928, according to a report by the customer ownership committee of the National Electric Light Association. The conclusion was to be anticipated in view of the monthly returns received by the ELECTRICAL WORLD, which indicated sales for 1929 in general below those for 1928, particularly in the first half year.

The report shows an even greater shrinkage in number of sales: 87,498 last year; 202,380 in 1928. The average number of shares per sale was 16½, or considerably larger than in preceding years. Dollar values are not given. Some years ago the average price approached $100 a share. Recently this has been materially lowered by large issues at various prices from $25 upward. For 1929 it may be taken around $65, which would bring the aggregate for this form of financing into the vicinity of $100,000,000.

Returns constituting the basis of the report were received from 230 companies, serving 17,079,682 customers, about 70 per cent of the total number and about 78 per cent of the number of customers served by private corporations. The totals given are therefore assumed to be complete. Sales were reported by 76 companies, representing about a fourth of the industry, as the following table shows:

Stockholder Data

Total all stockholders	681,29
Total shares held	34,086,67
Number of customer ownership sales, 1929	87,498
Number of shares sold	1,447,853

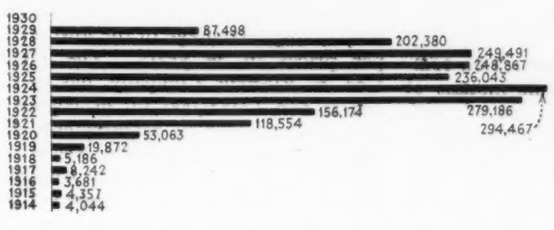
General Data

Number of customers	6,178,979
Population served	33,010,000
Number of employees	89,683
Revenue (total)	$543,852,433

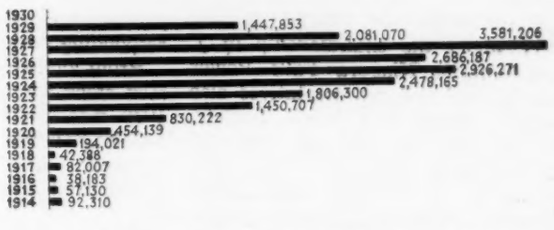
For 100 companies detailed data were obtained on stocks and stockholder classification for 1928 and 1929. These companies report an increase of 17 per cent in the number of shares outstanding. Of the increase 83 per cent was absorbed by corporations and non-resident stockholders. Despite a general belief that many companies had a net decline of customer stockholders in 1929, the composite figures show an increase of 25,371 customer stockholders, or 7.3 per cent. The committee comments thus on the increase of 4,377,867 shares:

It is safe to say that by far the greater proportion of new stock issued by these companies in 1929 was common as opposed to preferred stock. When it is remembered that it is usually preferred stock which is distributed on a customer ownership basis, there is no difficulty in seeing why customer ownership activities declined in 1929. The companies financed their equity requirements mainly by common-stock issues and therefore did not have much preferred stock available to offer their customers. Following similar conditions existing in 1928, selling efforts were relaxed or abandoned by many organizations—in fact, some of this let-down dates back to 1927. Considering all conditions, it seems surprising that customer ownership did not fall off even more.

Reports received from geographic division committees and other sources indicate a decided revival of customer ownership activities during 1930. A substantial part of the new capital going into construction this year will be raised through customer ownership distribution of preferred stocks.



Number of customer stockholders obtained yearly since 1914



Shares of stock sold yearly since 1914 under customer ownership plan

Business News and Markets

New Battery Standard

A REVISED NATIONAL STANDARD for dry cells and batteries, setting up authoritative specifications for materials, workmanship, performance, sizes and markings, has just been approved by the American Standards Association. This standard, which is the result of six years of study by an American Standards Association technical committee under the administrative direction of the United States Bureau of Standards, covers the dry cells and batteries for radio, telephone, ignition, flashlight and other uses. Fifteen national organizations were represented on the committee.

▼

Power Transformer Order

ALLIS-CHALMERS MANUFACTURING COMPANY, Milwaukee, announces receipt of an order from the West Virginia Hydro-Electric Company, a subsidiary of the Union Carbide & Carbon Corporation, covering ten large power transformers, amounting to approximately $500,000. This is the second order recently received by Allis-Chalmers from this company, the previous order covering two welded-steel surface condensers for use with 30,000-kva. steam turbines.

▼

Insulator Standards Approved by A. S. A.

APPROVAL OF THE AMERICAN STANDARD "Insulator Tests and Ratings" has just been announced by the American Standards Association. The standard was developed under the joint sponsorship of the American Institute of Electrical Engineers and the National Electrical Manufacturers' Association. The sectional committee in charge of the project, under the chairmanship of J. Allen Johnson, Niagara Falls Power Company, included representatives also from the American Ceramic Society, American Electric Railway Association, American Railway Association, Association of Edison Illuminating Companies, National Electric Light Association and the Bureau of Standards.

This standard, which covers insulators for power lines for voltages exceeding 750, is not to be interpreted as forming complete insulator specifications, but rather as defining the methods of making the various tests described when they are required. The standard specifies the complete design and routine tests for pin and suspension insulators. These comprise tests for dry flashover voltage, wet flashover voltage, puncture voltage and combined mechanical and electrical strengths. Pin insulators are rated according to dry flashover and wet flashover voltages expressed in kilovolts. Suspension insulators are rated according to dry flashover and wet flashover voltages expressed in kilovolts and also according to combined mechanical and electrical strength. The testing equipment and method of measuring voltage are required to be in conformity with the standards of the American Institute of Electrical Engineers. In an appendix a discussion of the variation of wet flashover voltage with water resistance is given.

▼

New York Metal Prices

SALES OF COPPER fell off sharply in the last week, contrasted with the volume booked in the two preceding weeks, but this occasioned no great surprise and producers maintained the price on the basis of 10 cents, delivered Connecticut. The September statistics revealed another substantial increase in stocks of refined copper.

	Oct. 8, 1930 Cents per Pound	Oct. 15, 1930 Cents per Pound
Copper, electrolytic	10	10
Lead, Am. S. & R. price	5.20	5.10
Antimony	7¼	7¼
Nickel, ingot	35	35
Zinc, spots	4.55	4.35
Tin, straits	26.80	25⅝
Aluminum, 99 per cent.	23.30	23.30

▼ ▼ ▼

General Electric Sales Billed Down 4.6 per Cent

ORDERS received by the General Electric Company during the third quarter of 1930 amounted to $77,338,074, compared with $116,688,014 for the corresponding quarter last year, President Gerard Swope announces. Orders received in the first nine months this year amounted to $267,651,832, compared with $337,404,470 during the corresponding period last year. As a result of the transfer of radio receiving set and tube business outlined in the 1929 annual report, orders received, sales billed and net income from sales in 1930 do not include radio sets and tubes, but income received is included in "other income."

Sales billed for the first nine months of 1930 amounted to $287,886,541, compared with $301,812,808 for the corresponding period last year.

Profit available for dividends on common stock for the first nine months of 1930 was $42,518,708, compared with $47,965,831 for the first nine months last year.

The profit available for common stock for the nine months is equivalent to $1.47 per share in 1930 and $1.66 per share in 1929 on the shares now outstanding.

A comparative statement of sales and earnings for nine months follows:

	1930	1929
Net sales billed	$287,886,541	$301,812,808
Less cost of sales	254,760,876	263,316,462
Net income from sales	$33,125,664	$38,496,346
Other income, less interest paid and sundry charges	11,324,254	11,400,578
Profit available for dividends	$44,449,918	$49,896,924
Less cash dividends on special stock	1,931,209	1,931,093
Profit available for dividends on common stock	$42,518,708	$47,965,831

▼

Utilities Heavy Buyers of Ten-Cent Copper

ANOTHER LARGE UTILITY SYSTEM has been taking advantage of the lowest copper prices in 34 years. The Pacific Gas & Electric Company has placed orders for 12,000,000 lb. of copper at 10 cents to cover its requirements during the coming year. The order was divided equally between the Anaconda Copper Company and General Cable Corporation. All of the copper purchased will be delivered in the form of wire or cable of various sizes and types.

The total cost, including that of manufacture, will exceed $1,500,000. Total **sales of copper** for domestic use since the metal became available at 10 cents are estimated by the *Engineering and Mining Journal* at about 120,000,000 lb. It is known that most of the copper was purchased by the utility companies.

Foreign sales of copper at the 10-cent level are estimated to have been about 40,000,000 lb. The free buying of copper wire and cable by public utility companies generally and the accumulation of the red metal by fabricators point to the conclusion that those large users of copper regard the price as cheap and believe that metal bought at the 10-cent level will ultimately show a profit on the investment. Because of that policy fabricators are reluctant to sell copper for delivery beyond the present year. Utility companies have sought to purchase the metal as far ahead as the end of the first half of 1931, but have been able to buy little for delivery beyond the first quarter of next year, while it is understood that most of the copper sold has been for delivery up to the end of 1930.

TRADE BRIEFS

Pacific Electric Manufacturing Corporation, San Francisco, has opened a new factory office in Boston under G. A. Wright.

•

Southern California Edison Company has placed orders for its full requirements of copper wire for 1930 and 1931 with the Anaconda Copper Company.

•

Domestic Electric Company which became a part of the Black & Decker group two years ago, is now known as the Black & Decker Electric Company.

•

Cutler-Hammer, Inc., reports for quarter ended September 30, 1930, shipments amounting to $2,198,116, compared with $2,683,398 in preceding quarter and $3,321,450 in third quarter of previous year.

•

A meeting of Westinghouse agent jobbers and Westinghouse contact men was held lately to discuss motor apparatus applications at the East Pittsburgh works of the Westinghouse company.

Pass & Seymour, Inc., announce that after October 1 Fulwiler & Chapman, Atlanta, Ga., will be their Southeastern sales representative, covering several Southern states.

•

The Okonite Company and the Okonite-Callender Cable Company, Inc., manufacturers of insulated wires and cables for electrical power, signal and control circuits, announce the appointment of W. R. Van Steenburgh as manager of the light and power department of the New York territory. He will direct sales and engineering activities in New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Virginia and the District of Columbia. Mr. Van Steenburgh has represented the Okonite companies in a sales capacity since early in 1917.

•

Directors of the Ohio Brass Company have declared an extra dividend of $1 per share on the common stock, in addition to the regular quarterly dividend of $1.25 per share, both payable October 15 to holders of record September 30.

▼ ▼ ▼

EXPORTS OF ELECTRICAL EQUIPMENT (PRELIMINARY)

Article	August 1929	August 1930
Generators:		
Direct current—		
Under 500 kw	$144,429	$74,055
500 kw. and over	25,980	246,098
Alternating current—		
Under 2,000 kva	33,769	10,077
2,000 kva. and over	.....	32,033
Steam turbine generator sets	59,356	45,422
Accessories and parts for generators	56,329	46,893
Arc welding sets	.....	38,999
Self-contained lighting outfits	65,087	94,301
Batteries:		
Storage batteries	199,211	.....
6-volt storage batteries	.....	152,461
Other storage batteries	.....	66,503
No. 6 dry cell batteries	.....	22,359
Flashlight batteries	179,867	245,278
Radio B and C batteries (dry)	67,768	43,133
Other dry and wet cell primary batteries	134,205	13,741
Transforming or converting apparatus:		
Power transformers, 500 kva. and over	108,028	49,672
Distribution transformers, less than 500 kva.	63,910	137,908
Instrument transformers	7,975	15,112
Other transformers	83,371	88,669
Complete battery chargers under 15 amperes	19,641	12,353
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	121,686	58,892
Transmission and distribution apparatus:		
Switchboard panels, except telephone	43,233	150,498
Switches and circuit breakers over 10 amp.	174,153	187,277
Fuses	40,711	29,724
Watt-hour and other measuring meters	87,483	58,998
Electrical indicating instruments	57,486	71,546
Electrical recording instruments	22,023	28,175
Other electrical testing apparatus	88,360	71,637
Lightning arresters, choke coils, reactors and other protective devices	53,642	78,963

Article	August 1929	August 1930
Motors, starters, and controllers:		
Motors, ¼ hp. and under	$241,430	$236,231
Motors, over ¼ and under 1 hp.	53,315	58,393
Stationary motors—		
1 to 200 hp.	354,929	209,714
Over 200 hp.	32,894	87,323
Railway motors	35,040	.....
Electric locomotives—		
Railway	.....	.....
Mining and industrial	3,100	22,225
Station and warehouse electric motor trucks	13,278	20,837
Starting and controlling equipment—		
For industrial motors	168,836	132,434
For electric railway and vehicle motors	6,703	8,311
Portable electric tools	97,406	102,878
Accessories and parts for motors	213,270	162,311
Refrigeration sets up to ¼ ton capacity	1,208,733	.....
Refrigeration sets over ¼ to 1 ton capacity	228,571	.....
Electric household refrigerators	.....	586,105
Electric commercial refrigerators up to 1 ton	.....	136,619
Thermodynamic refrigerators	.....	.....
Electric appliances:		
Electric fans	72,432	102,869
Electromechanical health exercisers	.....	9,025
Electric incandescent light bulbs—		
Metal filament	94,888	.....
For automobiles, flashlights and Christmas trees	.....	20,915
Other metal filament bulbs	.....	51,857
Other electric lamp bulbs	58,624	23,009
Flashlight cases	172,030	88,373
Searchlights and floodlights	32,294	26,852
Motor-driven household devices—		
Electric household washing machines	148,095	111,106
Electric vacuum cleaners	98,135	180,777
Other motor-driven devices, except tools	77,399	53,890
Electric flatirons	36,354	20,100
Electric cooking ranges	17,582	50,067
Other domestic heating and cooking devices	75,140	78,906
Industrial electric furnaces and ovens	31,182	31,651
Therapeutic and X-ray apparatus	132,057	127,545

Article	August 1929	August 1930
Signal and communication devices:		
Radio apparatus—		
Transmitting tubes, sets, and parts	$390,814	$48,435
Receiving sets	837,976	904,967
Radio receiving tubes	130,945	237,475
Receiving-set components	398,479	418,995
Loudspeakers	178,827	142,047
Other receiving-set accessories	365,912	122,452
Telegraph apparatus	67,494	77,182
Telephone apparatus—		
Telephone instruments	53,565	23,981
Telephone switchboards	110,845	55,168
Other telephone equipment	328,838	325,693
Bells, buzzers, annunciators and alarms	40,803	21,792
Other electric apparatus:		
Spark plugs	149,707	91,491
Other starting, lighting, and ignition equipment	157,399	97,190
Insulating material	122,648	77,676
Metal conduit, outlet, and switch boxes	121,087	85,297
Sockets, outlets, fuse blocks, and lighting switches	140,002	133,830
Electric interior lighting fixtures	177,971	157,645
Electric street lighting fixtures	31,399	33,638
Other wiring supplies and line material	108,190	141,849
Other electrical apparatus, n. e. s.	1,002,733	765,563
Rubber and friction tape	33,348	34,650
Globes and shades for lighting fixtures	42,352	36,876
Glass electric insulators	26,110	9,553
Electric porcelain:		
For less than 6,600 volts	124,885	43,187
For 6,600 volts and over	60,592	37,626
Carbons and electrodes:		
Electrodes for electric furnaces	175,109	161,671
Other carbon products	94,413	50,470
Insulated iron or steel wire and cable	18,699	10,109
Copper, bare wire	200,025	191,442
Insulated copper wire and cable	393,011	.....
Rubber-covered wire	.....	54,763
Weatherproof wire	.....	31,517
Telephone cable	.....	23,092
Other insulated copper wire	.....	222,270
Totals	$11,722,620	$9,780,692
Eight months ended Aug. 31	$93,736,401	$90,899,154

Market Conditions

THE equipment market in the Eastern district displays a decided improvement in tone. Commitments are larger than for some weeks.

——POWER-COMPANY BUSINESS on the Pacific Coast promising, although actual orders are small.

——MIDDLE WEST BUSINESS shows little if any definite improvement, while business in New England has accelerated somewhat.

▼ ▼ ▼

EASTERN

—A DECIDEDLY IMPROVED TONE *is being exhibited in the electrical equipment market in the Eastern district, and commitments are running at a higher and more substantial rate than for several weeks past. The change seems to have developed almost overnight. Large manufacturers of heavy equipment at New York, Philadelphia and other points in the East are booking substantial business. What is equally if not more encouraging is the improved rate of inquiries both from central stations and industrial establishments, and the outlook for worth-while sales appears brighter than for some time. The electric appliance market shows signs of revival.*

A power company in northern New York has placed an order for cable with a New York manufacturer to an amount of about $70,000. The Safe Harbor Water Power Corporation has contracted with Cramp-Morris Industrials, Inc., Philadelphia, for three 42,000-hp. hydraulic turbines for its hydro-electric power development now under way at Safe Harbor, near Holtwood, Pa., and is expected to place other commitments for auxiliary apparatus at an early date. The Moore Steam Turbine Corporation, Wellsville, N. Y., has secured a commitment from the United States Navy Department for three 500-kw. turbo-generator units for the naval air station at Pensacola, Fla., totaling $51,912. A Pittsburgh manufacturer has obtained an order for an engine-generator set for an installation in Ohio, at a price of $35,215, the contract for boilers, stokers, etc., going to a Toledo maker. A metropolitan central station has contracted with a New York manufacturer for network protectors to an amount of $60,000.

In the industrial field there are some excellent prospects developing for early maturity, and inquiries for motors, controls and auxiliary apparatus show a better spread in different branches of activity. An oil refining company at New York has given an order to a state manufacturer for a turbo-generator unit for an installation in northern New York costing $30,000. A maker of electric washing machines in the district last noted reports heavier orders, with demand for the past fortnight in excess of factory output. Another manufacturer of similar units in the Middle West says that sales for the first nine months of the year are larger than those for the entire year of 1929. Orders are coming from these quarters for fractional-horsepower motors.

CONSTRUCTION PROJECTS

Department of Health, New York, is asking bids until October 25 for hospital building at Rockaway Beach, including power house, to cost $400,000. Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until October 28 for 20 sets portable electric pumps and spares for Brooklyn Navy Yard (Schedule 4223). Department of Transit, New York, is arranging fund of $52,000,000 for new construction, extensions and improvements in transit system. Continental Can Company, New York, has asked bids on general contract for factory at Camden, N. J., to cost $1,000,000. Reading Company, Philadelphia, has plans for group of seven power substations in connection with railway electrification at Ambler, Jenkintown and other points to cost over $300,000. Mount Joy, Pa., contemplates ornamental lighting system. Pittsburgh & Lake Erie Railroad Company, Pittsburgh, plans a river-rail terminal at Monaca, Pa., to cost $400,000. Bureau of Supplies and Accounts, Navy Department, Washington, is asking bids until October 28 for snap switches. (Schedule 4261.)

❖

SOUTHEAST

—OPINION HAS IT *that the worst is over in the Southeast and that the next few months will see a slow though steady improvement in business conditions. The volume of small orders from central stations is reasonably satisfactory, and purchases by and inquiries from industrial interests are better than for several months past.*

One company's purchases last week of transformers amounted to $12,100, while its meter orders totaled $7,060. Two orders for voltage regulators totaling $7,900 were placed by a power company, as well as an order for $6,000 in disconnecting switches. Some other central-station orders were for 30,000 lb. of stranded bare copper, $4,200 in insulators and $2,450 in creosoted pine poles. One company has inquiries out on three 333-kva. and three 75-kva. transformers. An electrification project on the part of an ice company in Georgia with several plants resulted last week in an order for $35,000 worth of synchronous and $10,000 worth of induction motors.

CONSTRUCTION PROJECTS

Norfolk & Western Railway Company, Norfolk, Va., plans addition to warehouse and terminal to cost $200,000. Weirton Steel Company, Weirton, W. Va., plans electrification of tinplate mill at Clarksburg, W. Va., to cost $200,000. Wil-Ten Mining Company, Charleston, Tenn., is planning power plant and other improvements at properties to cost over $100,000. Aiken, S. C., contemplates installation of Diesel engines and other equipment for electric lighting system and water plant. Birmingham, Ala., plans installation of lighting system at proposed municipal airport to cost close to $1,000,000. Alabama Power Company, Birmingham, plans power substation at Anniston, Ala., reported to cost over $65,000.

❖

MIDDLE WEST

—THE FIRST WEEK IN OCTOBER *did not show much, if any improvement in general business in the Middle West section. Definite signs of a returning prosperity are extremely obscure, although it is felt that some improvement has been effected. Industrial activity still continues quite spotty while car loadings continue to decrease.*

The major activities are maintaining their positions with difficulty. It is hoped that the advent of new models in the automotive field will stimulate business in that industry. Reports of the large mail-order houses are not encouraging, although retail trade has revived to some extent. The various utility companies are proceeding with all necessary construction work, but investment budgets have been curtailed to a considerable extent. The demand for apparatus has been limited. Some of the interesting items placed this week include a transformer-house crane complete with appurtenances to cost $26,000, one 1,000-kva. power transformer, three 22,000-volt, single-phase, 60-cycle outdoor-type potential transformers, 500,000 lb. triple-braid weatherproof wire and cable, and $75,000 of construction orders.

CONSTRUCTION PROJECTS

Signal Corps Procurement District, Chicago, will receive bids until November 11 for copper wire, lamp cord, 37 switching

telephone jack panels, etc. (Circular 13). University of Detroit High School has filed plans for a power house. State Department of Institutions, Indianapolis, plans power plant at institution at Butlerville, Ind., to cost $50,000. Link-Belt Company, Indianapolis, plans installation of pulverized-fuel system at plant to cost $125,000. Reserve Lithograph & Printing Company, Cleveland, plans plant to cost $150,000. Ohio Edison Company, Akron, has authorized construction of a transmission line from Toronto, Ohio, to East Akron, to cost over $600,000.

❖

PACIFIC COAST

—POWER-COMPANY BUYING, *which has been almost the backbone of the year's business, promises to increase considerably. Shipbuilding, formerly a premier industry of the bay region, seems due for a renaissance, and government purchasing is also good and well distributed. Major building construction also promises well for all sections. Actual sales, however, up to October showed considerably less than last year, August, for example, recording a Coast average of 25 per cent less than for 1929. A renewed optimism based largely upon agricultural money is manifesting itself.*

Power-company prospective ordering includes the first 6,000-kva. unit at Pittsburg, Calif., chiefly to handle the new chemical plant there; a 70-mile, 88,000-volt steel-tower line in the Riverside district, with a capacity of 40,000 hp., costing $350,000; a carload of guy strand and 4,000 cross-arms for Los Angeles, a proposed expenditure of $300,000 for high-voltage transmission equipment, expenditure of $30,000 for increasing load in the Redwood City area, and new substations at Ukiah and Modesto. San Francisco is making a vigorous bid for one of the new Panama Line boats, and $600,000 for improvements is to be spent in the Bethlehem plant. A twelve-million-dollar cruiser is to be built immediately at Mare Island, employing 1,000 men for a year or so to come. Ten thousand dollars is to be spent there on electrical installation for berths and docks. Barracks and hangars are to be built for the army flying corps near Sacramento. Municipal purchasing includes an electrical award of $12,000 for the Stockton hospital, two months' requirements of rubber and leaded cables for Oakland, a street-lighting award of $16,000 by Alhambra, and an electrical award of $49,000 for a new state building in Los Angeles, the outstanding order covering an award of $179,488 for Los Angeles street lighting.

Sales reported on the northern Pacific Coast last week show a marked improvement over the two first weeks of the month, and indications seem to point to its continuance. The movement included $4,000 worth of motors ranging from 40-hp. down to a lumber mill for a crane, 40 machines from 100 hp. down to utility companies and miscellaneous sources, 25 machines from 100 hp. down to sawmills, paper mills and dealers, twenty distribution transformers from 25-kw. down to a central station, and a floodlighting system to cost $4,000 for a football field at Aberdeen, Wash. The Seattle *Daily Times* is changing its press-room equipment from direct to alternating current and has bought $18,000 worth of miscellaneous motors, also one 100-hp. and two 150-hp. a.c. press drives, the major portion of order going to the General Electric Company. Prospects from the Oregon sawmills for buying are reported excellent, and a lumber mill near Seattle has specifications out for about $8,000 worth of motors. The city of Seattle opened bids for the second time for excitation and regulation equipment for its Lake Union steam auxiliary, the latest offers ranging from $11,200 to $35,078.

CONSTRUCTION PROJECTS

Hammer-Bray Company, Oakland, Calif., plans addition to stove manufacturing plant to cost $150,000. San Francisco contemplates early call for bids for 600 metal street-lighting standards and 300 concrete standards to cost about $160,000. Los Angeles and Anaheim, Calif., plans ornamental lighting systems. State Department of Public Works, Sacramento, plans power plant at institution at Agnew, Calif., to cost $350,000 with other buildings. Pacific Gas & Electric Company, San Francisco, contemplates hydro-electric power plant in Shasta County, with capacity of 20,400 hp. Northwestern Electric Company, Portland, Ore., will build a power substation to cost $65,000.

❖

SOUTHWEST

—GENERAL CONDITIONS *are virtually the same as last report. About the same volume of medium-sized apparatus moved, but there have been no contracts closed that are worthy of special mention.*

Manufacturers of electric signs say that they have had a fair business so far and a normal number of inquiries coming in. The record low price of lead has delayed contemplated plant extension in the Southeast lead district.

CONSTRUCTION PROJECTS

American Car & Foundry Company, St. Louis, contemplates an addition to plant to cost over $100,000. Arkansas Power & Light Company, Pine Bluff, plans extensions and improvements in power substation at El Dorado, Ark., to cost $70,000. Texas Electric Service Company, Fort Worth, plans extensions in underground and overhead power lines to cost over $150,000. Central Power & Light Company, San Antonio, is said to have plans maturing for a hydro-electric power development on the Guadalupe River to cost over $1,000,000.

❖

NEW ENGLAND

—SEASONAL IMPROVEMENT OF BUSINESS *is reflected in increased activity in industrial and mercantile lighting fields. Preliminary scrutiny of the market for electrical merchandise reveals that a promising development of pre-holiday business is about to begin. Shortages are reported in some makes of electrically operated clocks and radio sets. Inquiries for power apparatus are encouraging and considerable important groundwork is being done in connection with expected transmission and distribution developments in eastern and central New England in 1931. Motor sales, while somewhat disappointing in the mass, reflect improved conditions in the textile industry and are still being recorded in substantial volume.*

Recent orders include about 500 motors for a textile job, with 1,000 more under bid for another consumer in this field; a 3,450-kw. rotary converter for city service and various industrial lighting fixtures. Industrial lighting jobs amounting to upward of $100,000 are in process or on the boards in eastern Massachusetts, and a windowless building for a Fitchburg factory has just been announced with 1,000-watt units to be employed on a liberal scale.

Important engineering studies are being pushed toward completion to guide executives of power companies in determining construction budgets for 1931 and to some extent for 1932. A two-year construction program involving the expenditure of about $3,500,000 has been launched by the Western Massachusetts Companies to strengthen the transmission system and provide for 110-kv. operation on certain routes.

CONSTRUCTION PROJECTS

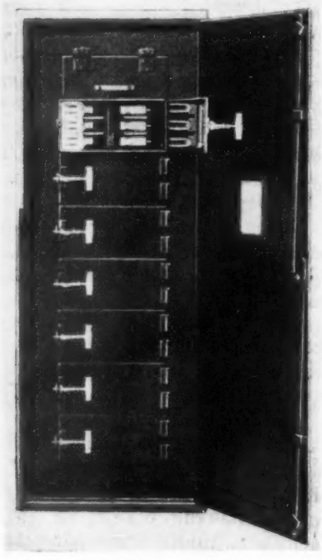
Boston & Maine Railroad Company, Boston, will make extensions and improvements in shops at Concord, N. H., to cost about $350,000. Holyoke, Mass., has plans for a vocational training school to cost over $200,000. Weymouth (Mass.) Light & Power Company plans power substation at South Weymouth to cost about $50,000. Fall River (Mass.) Electric Light Company has filed plans for a power substation to cost about $65,000. Hartford (Conn.) Electric Light Company has filed plans for a power substation to cost about $45,000. Waterbury (Conn.) Buckle Company plans plant to cost close to $100,000.

New Equipment Available

No Live Parts Exposed on Distribution Panel

SAFETY DISTRIBUTION PANELS on which no live parts can be touched, even when the switch door is open, are announced by the Square D Company, Detroit. Opening the switch on these panels disconnects all live parts and leaves the fuses accessible.

The switch element provides at least



50 per cent overload rupturing capacity without flashing over, breaking down or in any way providing a hazard for the operator, according to the manufacturer. It meets the requirements of the Underwriters' Laboratories and is said to have been successfully operated at 250 per cent and 1,000 per cent overload in tests.

▼

Small Electric Furnace for Combustion Analysis

ELECTCIC FURNACES DESIGNED for combustion analysis are announced by the Sentry Company, Taunton, Mass. These furnaces, which can be operated up to 1,400 deg. C., use silicon carbide type heating elements and air-cooled alloy terminals to minimize adjustment and replacement of heating elements.

The heating chambers are 9 in. long and will receive a tube of 1½-in. bore and 1¾-in. outside diameter. Quartz tubes are used up to 1,100 deg. C., porcelain tubes above this value. The furnaces are equipped with rheostats and are designed for operation at 110 volts, alternating or direct current, with a maximum demand of 3.5 kw.

▼

WELDING ELECTRODES which make joints said to have an elongation of from 33 to 36 per cent are announced by the Alloy Welding Processes, Ltd., London. These figures for the elongation were obtained for twelve test joints in which the elongation was measured between points 1 in. apart. The elongation was attained with an entire absence of porosity, according to the manufacturer. This new arc-welding electrode is designated as "Cresta" and is said to have a tensile strength of from 27 to 28 tons.

▼

Electric Space Heaters Direct Heat to Any Spot

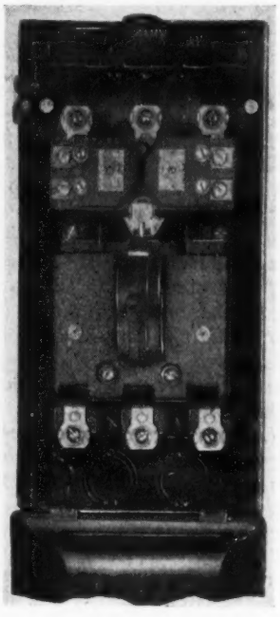
ELECTRIC HEATERS UTILIZING THE PRINCIPLE of mechanical air circulation and acting to deliver either hot or cool air to the spot where it is needed are announced by the American Foundry Equipment Company, Mishawaka, Ind. These heaters, known as "Thermofans," consist of an electric heating element cast integrally with an aluminum radiator. A silent motor and fan disseminate the warm air to every part of the area to be heated and keep all the air in constant circulation, according to the manufacturer.

The "Thermofan" is said to raise

the temperature in 1,000 cu.ft. of space at the rate of 1 deg. per minute. The unit is made for either 1,000- or 1,600-watt service, on 110 or 115 volts, a.c. or d.c.

Small Starting Switch with Reset Protector

SMALL, SIMPLE AND INEXPENSIVE motor-starting switches with resettable automatic overload protection are announced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This starter, designated as



WK-16, is especially suitable for use with textile loom and machine tool motors. The fact that it can be reset very rapidly makes it adaptable for industrial motor protection.

A method of tripping the contacts by heating a preformed bimetallic disk is employed. The disk maintains its shape up to a predetermined point, and when this point is reached it snaps into another position, thus affording a positive tripping means. There is no intermediate point in the tripping action.

▼

Disconnecting Clamps for Live-Line Service

LIVE-LINE DISCONNECTING CLAMPS which are designed for making connections to main conductors from lightning arresters, for apparatus requiring occasional disconnecting, for temporary grounding of transmission lines, and for connections during construction work, are announced by the General Electric Company, Schenectady.

The clamps are hook-operated and are rated at 200, 400 and 600 amp. They are made of copper alloy for use on both copper and aluminum conductors.